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ABSTRACT

This work reports on an initial study of the possibility of providing a suitable framework for the teaching of a foreign language grammar through string analysis, using French as the target language. Analysis of a string word list (word-class sequences) yields an overall view of the grammar. Details are furnished in a set of restrictions which state grammatical constraints on the defined strings. The constraints are mainly statements indicating which word-subclasses are compatible within a given string or in adjoined strings. Other key sections include: (1) excision as a teaching-oriented form of string analysis: a comparison of French sentences with their English translations, and (2) a comparison of French and English strings. Appendixes contain an English string list and sets of correspondences between the French and English strings. (RL)

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FRENCH STRING GRAMMAR

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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French String Grammar

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INTRODUCTION

String analysis provides a coherent framework for presenting grammatical material. It is relatively simple, computable, refinable, and, in string terms, related languages have similar descriptions. These features suggest that in addition to its successful use for computer parsing of natural language, string analysis could provide a suitable framework for the teaching of a foreign language grammar. This volume is a report on an initial study of this possibility, using French as the second language.

(1) By simple we mean that in string analysis it is relatively easy to grasp the overall organization of the grammar and to see how sentences are put together in the language. The list of elementary strings of the language (called here strings of the grammar, or simply "English strings," "French strings") gives the basic word-class sequences of which all sentences of the language are composed. The word-class sequences conform directly to word strings found in sentences, as illustrated by the listing of English strings in Appendix A and the index of French strings in Part 1, where each major string is accompanied by a word example. The intermediate constructs, i.e. elements of string definitions which are not word-classes (e.g. NVAR for N-variants, SUBJECT, OBJECT), serve to group together families of strings which have similar portions in corresponding string positions, and in the case of SUBJECT and OBJECT, to provide the recursive elements needed to describe such sentences as I know that she believes that ... . The number of strings for a language is relatively small--about 200 for English, exclusive of conjunctional strings, and a comparable number for French. The strings are organized into positional classes which indicate how the strings are combined (e.g. a string in RN occurs to the right of a noun N, a string in LV occurs to the left of a verb V, etc.). There are about 20 such string classes for a language.

While an overall view of the grammar can be obtained by inspection of the list of strings for the language, details are provided in a set of restrictions, which state grammatical constraints on the defined strings. These are mainly statements as to which word-subclasses are compatible within a given string or in adjoined strings. In the French string grammar of Part 1 these restrictions are stated (or sketched, where time did not permit a fuller linguistic investigation) directly following the string definition. The restrictions are stated

in a way suitable for future computerization of the grammar (e.g. including statements as to what does not occur, as in I, C_5, 2.-3.; XII, a_{C1}, 2.2,(c)), and also with future refinement along transformational lines in mind.*

(2) An unusual advantage of string grammar is its convenience for computerization. Among grammatical systems, string grammar is uniquely fitted for computer operations because it analyzes each sentence into contiguous parts. All sentence elements which are party to a grammatical relation are either elements of the same string or of contiguously adjoining strings. This makes it possible for a computer program to locate rather readily the elements of the sentence (qua elements of strings in the analysis of the sentence) on which a computer subprogram (carrying out a restriction test) is to be performed. A similar statement cannot be made about an analysis of sentences which takes the elements to be the words of the sentence or its immediate constituents.

The unitary character of string grammar also contributes to its computability, since it makes it possible to use a relatively simple general procedure (e.g. a top-down left-right algorithm, as is currently used by the N.Y.U. string program) for the analysis of each sentence. Also, since the procedure is based on principles of string analysis, and not any particular grammar, it is possible to use the same procedure with a different (foreign language) grammar to obtain the analysis of sentences which are described by the input (foreign language) grammar. This is one of the future objectives for the grammar of French reported in this volume.

(3) Refinability is an important feature both for a computer grammar and a teaching grammar. A principal feature of string analysis is that it treats advanced and complicated language material as a relatively simple extension of easy material in that language. This is true because string analysis arranges the grammatical facts in a hierarchical way so that in each section of the grammar (each string type) the detailed constructions appear as subtypes of the basic types. It is thus possible to organize the material into levels of grammatical detail. Each successive level does not invalidate the preceding one but only further refines it. Thus, a string definition in a "first-level" string grammar (such as is represented by the French grammar in this report) may be broken into different subtypes at a later stage of refinement. The segmentation of a sentence into its first level strings will still be valid

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* See (3) below. The restrictions of the English string grammar, which have been described in previous S.P.R. volumes (listed on back cover), are not included in this report.

as a framework in which more detailed restrictions, expressing the division of the major string types into subtypes, operate. It is in this sense that we speak of the future transformational refinement of the present string grammar.*

(4) Language similarities. A further property of string analysis which is very important for teaching foreign languages and for bilingual situations is the fact that languages are much more similar to each other in their string (and transformational) structure than in their classical grammatical features (e.g. types of tense, gender, case). In particular, the Indo-European languages are very similar to each other, and thus to English. This point is strikingly illustrated by the table of French-English string correspondences (Appendix B) and by the work in Parts 2 and 3.

With regard to the teaching of a foreign language grammar, if the grammar is organized in terms of string structure, a student can more readily draw on his perceptions of his own language in his comprehension of the language he is learning. A table of correspondences of the strings in the two languages enables the learner to judge the range of use and meaning of constructions in the new language in terms of grammatical distinctions which he knows from his own language. Secondly, a method such as the excision tables presented in Part 2 provides a practical activity which a student can carry out both in the construction and understanding of sentences in the new language, and in the comparison of these excisions with those he would carry out for the approximately semantically equivalent (translation) sentences of his own language.

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* It can be shown that an analysis of a sentence into strings can be related to the analysis of the same sentence by transformations, because each segment which is obtained by the string analysis of a sentence is equivalent to the contribution of a transformation operating on that sentence. The different transformational resultants which have the same string form give rise to the different string subtypes, each with its characteristic word subclasses. Cf. S.P.R. 7, Transformationally based English strings and their word-subclasses, B.B. Anderson, 1970.

Part 1: A String Grammar of French

Index of French Strings

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I. Center Strings: C. 9

C_1 = Σ tV Ω — Le garçon porte une valise. 10
Σ tV — La fièvre diminue. 10
Σ Ω^p tV — Le garçon la porte. 10

C_2 = Σ se tV — Jeanne s'évanouit. Cet air se chante. 12

C_3 = tV Σ — Passe un bourgeois. 12
Ω tV Σ — A cette lettre sont joints ces papiers. 12
tV Ω Σ — Seront passible d'amende les véhicules qui... 12
Ω Σ tV — Ça je ne sais pas. 12

C_4 = [voici/voilà] N — Voici un schéma. 14

C_5 = Ce $tV_{être}$ X QU C_i^{-X} — C'est Paul que Marie préfère. 17

C_6 = Il y tV_{avoir} N — Il y a quelqu'un. 19
Il tV_{il} Ω — Il pleut. 19

C_7 = Σ_s $tV_{être}$ [N_s/A_s] Ω_s — C'est un plaisir de le faire. 20
Σ_s tV_s (Ω) Ω_s — Ça arrive qu'il le fasse. 20

C_8 Question — Portes-tu la valise? 22

C_9 Imperative — Finissez! Partons d'ici! 25

C_{10} Exclamation — Vive la République! 25

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II. Subject Strings: Σ 27

Σ_1 = N Le garçon mange la pomme. 27

Σ_2 = QU $C_{1,2}^{-N}$ Qui dort dîne. 31

Σ_3 = Ce QU $C_{1,2}^{-N}$ Ce qu'il écrit est réputé. 32

Σ_4 = [QU_{int}/si] C Quand Jean reviendra n'est pas important. . . . 33

Σ_5 = V Ω Regarder le soleil brûle les yeux. 33

Σ_6 = que C_{1-7} Que tu es belle est certain. 33

III. Object Strings: Ω 36

Ω_0 = O Le soleil disparaît. 36

Ω_1 = N J'aime Paris. 37

Ω_2 = P N Marie pense à ce qu'elle fera demain. 38

Ω_3 = N P N Ils attribuent leurs succès à la chance. 39
P N N On démontre à Paul son égoïsme. 39

Ω_4 = A/N Marie tombera malade. 40
Il reste un ami. 40

Ω_5 = N N/N A On appelle ce chien un épagneul. 40
Elle se fait belle. 40

$\Omega_{5'}$ = N P A/N P N Paul considère Jean comme un ami. 41

Ω_6 = que $C_{1-7}^{(sub)}$ Ils pensaient que c'était un bon jeu. 41

Ω_7 = N que C_{1-7} Nous prévenons Paul que la route est coupée. 42

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Ω_8 = [de/à] N que $C_{1-7}^{(sub)}$ Le professeur obtient des élèves qu'ils se taisent. 43

Ω_9 = V Ω Jean aime rêver. 43

Ω_{10} = [de/à] V Ω Jean cherche à joindre Paul. 44

Ω_{11} = $N_{(1)}$ [de/à] V Ω Elle empêche les enfants de sortir. 44

Ω_{12} = [de/à] $N_{(1)}$ [de/à] V Ω Il exige des élèves d'être à l'heure. . . 45

Ω_{13} = (N_1) V Ω J'entends les oiseaux chanter. 46

Ω_{14} = V Ω à N_1 Elle fait boire le lait au bébé. 46

Ω_{15} = [à/de] N V Ω Jean dit de Pierre l'avoir rencontré. 47

Ω_{16} = [QU_{int}/si] C_{1-7} Jean demande si Paul est malade. 47

Ω_{17} = (P) QU C_{1-7}^{-N} Ils ignorent qui l'on soupçonne. 48

(P) QU V Ω-N Jean ne sais que penser de la situation. 48

Ω_{18} = A que C_{1-7} Je pense indispensable que Paul parte. 48

Ω_{19} = A de V Ω Jean trouve absurde de dire cela. 49

Ω_{20} = D Jean se comporte bien. Marie habite ici. 49

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IV. Object Pronouns: Ω^{P} 50

V. Objects of the verb être: $\Omega_{\hat{e}tre}$ 56

$\Omega_{\hat{e}tre1}$ = N Le chef est un brigand. 56

$\Omega_{\hat{e}tre2}$ = P N Pierre est en Suède. 58

$\Omega_{\hat{e}tre3}$ = A La terre est ronde. 59

$\Omega_{\hat{e}tre4}$ = V Ω Vivre est ne pas souffrir. 61

$\Omega_{\hat{e}tre5}$ = à V Ω Cet homme est à tuer. 61

$\Omega_{\hat{e}tre6}$ = de V Ω Le pire est de souffrir. 61

$\Omega_{\hat{e}tre7}$ = que C_{1-7} Mon avis est que Paul est gentil. 61

$\Omega_{\hat{e}tre8}$ = D Jean est ici. 61

$\Omega_{\hat{e}tre9}$ = Vé Ωé [par/de] N L'enfant est lavé par sa mère. 62

$\Omega_{\hat{e}tre10}$ = Ω_{avoir1} = Vé Ω Je suis allé à Cannes. 65
J'ai porté la valise. 65

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VI. Right Adjuncts of N: r_N 66

r_{N1} = N mon ami le docteur 66

r_{N2} = P N la femme de Jean, une promenade en forêt 66

r_{N3} = A une table ronde. 68

r_{N4} = Vé Ωé [par/de] N les dégâts constatés par l'huissier 70

r_{N5} = de [A/D] dix places de disponibles, un ami de toujours . . . 70

r_{N6} = QU $C^{-N/P\ N/O}$ l'homme qui entre au cinéma 70

r_{N7} = Vant Ω des personnes exigeant le respect 71

r_{N8} = à V Ω^{-N} le linge à repasser. 71

r_{N9} = que C_{1-7} le fait qu'il parte 71

r_{N10} = [de/à] V Ω la certitude de réussir 72

VII. Left Adjuncts of N: ℓ_N 73

ℓ_{N1} = A une terrible nouvelle 73

ℓ_{N2} = N P Une majorité de ministres (ont voté). 74

ℓ_{N3} = D_q de Beaucoup d'élèves (sont reçus). 75

VIII. All-Position Adjuncts of N: a_N 76

a_{N1} = A(étant A) Tranquilles, les bêtes passaient dans le pré. . 76

a_{N2} = N(étant N) Artiste, Jean souffrait 76

a_{N3} = Vé Ωé(étant Vé Ωé) Elus délégués, les dix mécanos 76

a_{N4} = P N(étant P N) En cholère, elle a tué le chat. 76

a_{N5} = N/Pro Il va dire un mot à ce type, Pierre. 76
Tous, nous sommes mortels. 76

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IX. Right Adjuncts of A: r_A 77

r_{A1} = P N fidele à sa femme 77

r_{A2} = que C content que son fils lui ressemble 77

r_{A3} = [à/de] V Ω heureux de partir en vacances 78

r_{A4} = [à/de] V Ω certain de triompher 78
[à/de] V Ω^{-N} bonnes à jeter 78

r_{A5} = D gentille au possible 78

X. Adjuncts of A, D, and Q: ℓ_A, ℓ_D, ℓ_Q, r_Q 79

ℓ_A = D assez lourde 79

ℓ_D = D très peu malade 79

ℓ_{Q1} = D environs 50 élèves 79

ℓ_{Q2} = N_d de une profondeur de 10 mètres 80

r_{Q1} = (de) ... à Q (N_m) 5 à 6 élèves 80

r_{Q2} = D 50 élèves environ 80

r_{Q3} = de N_d 10 metres de haut 80

XI. Adjuncts of the Verb: a_V 81

a_{V1} = P N Il parlait avec ferveur. 81

a_{V2} = D Jean travaille beaucoup. 81

XII. Adjuncts of C (Center String): a_C 82

a_{C1} = D Ces opérations sont désormais indolores. 82
Dn (negation) Jean n'aime pas conduire vite. 82

a_{C2} = N Il aime, la nuit, se promener sur le quais. 84

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a_{C3} = P N Les hommes, à la compagne, vivent selon les saisons. . 84

a_{C4} = C_s C_{1-7} L'enfant est malade parce qu'il a trop mangé. . . . 85

a_{C5} = C_s V Ω Jean va sans le dire à Marie. 87

a_{C6} = en Vant Ω Jean se rend odieux en parlant sans cesse de lui. 87

a_{C7} = Vant Ω Faisant son marché, Jeanne rencontra Jean. 87

a_{C8} = N Vant Ω Jean annonçant son retour, Marie retrouve la joie de vivre. 87

a_{C9} = D_{in} C Je me suis trouvé mal, tant il faisait chaud. 88

a_{C10} = tV-Σ Ω Fut-il beau, je ne l'aimerais pas. 88

a_{C11} = C^{cond} Jean serait sérieux, tout le monde l'aimerait. . . . 88

a_{C12} = [de/à] V Ω Jean, à lire dans le noir, s'est usé la vue. . 88

a_{C13} = Il y a N_t J'ai vu ce film il y a trois ans. 89

a_{C14} = tV Σ C'est idiot, pensa Jean, de croire cette femme. . . . 89

a_{C15} = [pour/quant à] N Pour le visage, je l'ai carré. 89

a_{C16} = [pour/tout/si][A/D] $tV_{être}$ Σ Si gentil soit-il, elle ne l'aime pas. 90

a_{C17} = [pour/tout/si][A/D] que Σ tV Pour vite qu'il coure, il ne la rattrapera pas. 90

a_{C18} = [tout/quel/quelque] N que Σ tV Quelque décision qu'il prenne, il n'obtient rien. . 90

a_{C19} = ce QU $C_1^{-\Sigma/\Omega}$ Il est revenu plus tôt que prévu, ce qui nous à beaucoup plu. 90

XIII. Right Adjuncts of X: r_X. 91

r_{X1} = C_c X Marie aime le beurre et le fromage. 91

r_{X2} = C_{cm} X Cet arbre est plus vert que celui-ci. 92

List of Major Symbols Used

x[a/b]y = xay or xby

a/b = a or b

$\left\{\begin{matrix}a\\b\end{matrix}\right\}$ ... $\left\{\begin{matrix}c\\d\end{matrix}\right\}$ = a...c/b...d

a ≈ b a is semantically equivalent to b.

⊭ S S is not a sentence of the language.

S(sub) Verb in S is subjunctive for stated cases.

Σ subject

Ω object

$\Omega_a\Omega_b$ two part object

Ωé passive object (V, $\Omega_{\hat{e}tre9}$, Table 4)

$V_j\Omega_j$ verb subclass V_j occurs with object string Ω_j

Ω^p object pronoun which precedes the verb.

V verb

tV tensed verb(see text preceding C_1 in I)

Vé past participle

Vant present participle

Vn nominalized verb

A adjective

A_{ind} indefinite adjective(II, Σ_1; VII, ℓ_{N1})

Na adjective derived from a noun(VI, r_{N3})

A_r adjective which occurs characteristically to the right of N(VI, r_{N3})

N noun

N_r noun replacer string (Note at end of II, Σ_3; III, Ω_1)

N_1 N subject of infinitive verb (The context should distinguish this use from occurrences of N_1 as subscripted N.)

N_s, V_s, A_s subclasses of nouns, verbs and adjectives which permit the occurrence of a nominalized sentence as Σ, Ω, or adjunct.(I, C_7)

N_{coll} collective noun (II, Σ_1, 1.; III, Ω_1; VII, ℓ_{N2})

N_m noun of measure (mètre, litre, franc) (II, Σ_1, 5.)

N_d noun of dimension (longueur)(X, ℓ_{Q2})

D adverb

D_q adverb of quantity (beaucoup)

D_n adverb of negation (ne...pas)(XII, a_{C1})

P preposition

T article or determinant(II, Σ_1, 1.)

Q quantifier

C_s subordinating conjunction (XII, a_{C4})

C_c coordinating conjunction (XIII, r_{x1})

C_{cm} comparative conjunction (XIII, r_{x2})

M mark of punctuation occurring as a conjunction (XIII, r_{x1}, 4)

QU qui, que, quoi, etc., as noted in context

QU C_1^{-N} a QU-word followed by C_1 where an N from C_1 occurs as a bound pronoun in the QU-word.

Pro pronoun

Note: The lists of words, either in parentheses or after a colon, which follow a symbol for a word-subclass (such as V_s) are as a rule samples of the membership of that word class and not its total membership.

I. CENTER STRINGS: C

In this section the main types of center strings are described. In several cases more than one form of the center string is presented; for example, C_1 has three variants: Σ tV Ω, Σ tV, $\Sigma\ \Omega^p$ tV.* Σ tV Ω is the principle form, Σ tV is the form which results when $\Omega = 0$, and $\Sigma\ \Omega^p$ tV is the form which results when the object, or part of the object, is a pronoun; the pronoun then appears directly preceding the verb (cf. IV). In general, when several forms are given for a center string, the first form is to be taken as the principal definition, and the remaining forms as variants. A variant may represent a distinguished case of the principal formula (e.g. the variant Σ tV of C_1), or a change in form which regularly results when one of the elements takes on a particular value, e.g. the permutation of the object when in pronominal form to the position before the verb, as in the variant $\Sigma\ \Omega^p$ tV of C_1. The center string of a sentence is sometimes preceded by a conjunction C_c, e.g. et, mais (Mais Paul y pense), and is always followed by an appropriate punctuation mark, e.g. period, question mark, though these facts are not noted in the definitions.

It should be noted that the definition of separate center strings C_{5-7} for particular cases where special subclasses and special Σ and Ω strings are called for entails a change in the definition of tV. In C_{1-3}, tV signifies a tensed verb, including être, avoir, venir whether these verbs occur as main verbs or auxiliaries (e.g. être in Il est mechant versus être in Il est parti). Any restrictions obtaining between a verb tV and its object then apply as restrictions on the same verb and its object when the verb occurs in the form Vé following être or avoir (or in the form V following venir de). In the case of the center strings C_{5-7}, such restrictions are stated as part of the definition of the center string. For example, in the definition of C_7, the formula $\Sigma_s\ tV_{\text{être}}\ A_s\ \Omega_s$ (Il est clair qu'elle veut partir) indicates that the verb is être, that the adjective following être is in the subclass A_s, that A_s is followed by a string Ω_s, and that the subject of être is Σ_s. In order for this formula to cover similar sentences in which the verb occurs with an auxiliary (Il a été clair qu'elle voulait partir), we must understand by tV in C_7 (and in C_5, C_6) either a verb in tensed form, or the same verb in the form Vé preceded by the appropriate tensed auxiliary être or avoir (or in the form V preceded by a tensed form of venir de).

---

* Σ stands for subject strings (II), Ω for object strings (III), Ω^p for object pronouns (IV). The symbol tV stands for the tensed (and first occurring) verb of the center string except as noted below. Vé stands for the past participle.

C_1 = Σ tV Ω — Le garçon porte une valise.
Σ tV — La fièvre diminue.
Σ Ω^p tV — Le garçon la porte, Jeanne se lave, Paul y pense, Pierre en a acheté.

1. In connection with the pronoun se, the question arises as to whether se = Ω and should be analysed as an object pronoun similar to the other object pronouns Ω^p in C_1, or whether se $\neq \Omega$ and should be analysed as part of the verb or as an element of a center string Σ se tV (C_2).

1.1. The case of se = Ω^p

Two classes of verbs permit se to be analysed as the object Ω^p in $C_1 = \Sigma\ \Omega^p$ tV:

a) Pronominal reciprocal verbs occurring with a plural subject, or pronominal verbs which require a plural or collective subject: Ils se battent, Nous nous sommes rencontrés, La foule se réunit.

b) Reflexive pronominal verbs: Je me lave, Tu te regardes, Jeanne s'est coupée.*

In (a) and (b), the object pronoun refers to the same person as Σ; however, these same verbs can also be found with a noun object (Je lave la vaisselle) and with an Ω^p that does not agree with Σ (Je la lave). The form with se results when the object pronoun is le, la, or les, and refers to the same individual(s) as the subject; in this case, le, la, les → se. This is true whether the verb in C_1 is pronominal or an ordinary verb: Il se mange, Il se coupe. It should be noted that se has the interpretation of a direct object in these cases.

Two cases of se = Ω^p, where se is not the direct object, can also be grouped within C_1:

c) A subclass of transitive verbs that appear in C_1 (e.g. promener in Jeanne promène l'enfant, Jeanne le promène) also has a pronominal form (Jeanne se promène), but here se does not have the interpretation of being the object of the verb in the same sense as when the verb occurs in C_1 with a different object: # Jeanne promène elle-même. Verbs in this class include se promener, s'amuser, s'asseoir.

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* When a particular verb occurring in the plural happens to be in both the subclasses (a) and (b), there is an ambiguity: Ils se lavent (eux-mêmes), Ils se lavent (les uns-les autres).

d) Se occurs as the indirect object (se = Ω_b*or a_V): Jeanne se coupe du pain. (≈ Jeanne coupe du pain pour elle-même.) The pronoun agrees in number and person with the subject (Je - me, Tu - te, etc.). As in (a), (b), above, the verb can appear in C_1 with an object different from Σ, and the change from le, la, les to se is automatic when the object refers to the same individual(s) as the subject.

1.2. The case of se ≠ Ω^p:

a) With verbs that are essentially pronominal (e.g. s'évader, s'évanouir), se precedes tV as does Ω^p in C_1, but these verbs do not occur in Σ tV Ω with Ω = N, nor in the form Σ Ω^p tV, nor in the passive: Les prisonniers s'évaderont, ∄ On évade quelqu'un, ∄ On l'évade, ∄ Quelqu'un a été évadé par quelque chose.

b) There is also an occurrence of Σ se tV which has a special relation to a corresponding form Pro_{ind} tV Ω (where Pro_{ind} stands for indefinite pronoun): the choice of Σ in Σ se tV is the same as the choice of Ω in Pro_{ind} tV Ω. The result is that corresponding sentences in the two forms have the same meaning:

Pro_{ind} tV Ω	On chante cet air,	On vend les voitures à crédit.
Σ se tV	Cet air se chante,	Les voitures se vendent à crédit.

Here, se is invariable because it agrees with the subject, which is always in the third person. Note that there are subclasses of verbs which do not occur in this form: On aime les tartes, ∄ Les tartes s'aiment.

For the two cases where se ≠ Ω^p, we have defined a center string C_2, but we might equally well treat all occurrences with se as cases of a single center string (e.g. C_2, below) by disregarding such questions as whether the verbs which occur with se also occur with other N objects and other Ω^p, and whether se has the interpretation of object or not.

2. In C_1 (and other center strings in which Σ and tV appear), Σ and tV agree in number. Details are presented in II, Σ_1, 1.3.

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* Ω_b stands for the second part of a two-part object $\Omega = \Omega_a\Omega_b$. a_V stands for adjuncts of the verb (XI).

C_2 = Σ se tV — Jeanne s'est évanouie.
Cet air se chante.

(discussed in C1, 1.2, above)

C_3 = tV Σ — Passe un bourgeois.
Ω tV Σ — A cette lettre sont joints ces papiers.
tV Ω Σ — Seront passibles d'amende les véhicules qui...
Ω Σ tV — A cette lettre Pierre ne répondra pas.

The center string C_3 is due to the possibility of having different arrangements (orders) of subject, verb, and object within the center string. Given any one of the inversions defined in C_3, we can always reconstruct the sentence in the order of C_1 (Σ tV Ω). In the center string C_3, the elements Σ, tV, and Ω often belong to subclasses. The principal cases are the following:

1. tV Σ: Passe un bourgeois. In this form Σ = Σ_{1-3}, and Ω = Ω_0. Some of the different types of verbs which appear most naturally in this form are:

1.1. Verbs with Ω = 0 only, i.e. verbs whose only object is Ω = 0 (disparaître, naître, exister): Existent ceux qui agissent.

1.2. Verbs with Ω = 0 or Ω = D (marcher, arriver, passer, entrer): Passe un artiste.

1.3. Verbs with Ω = 0 or Ω = Vn (rêver, vivre, mourir): Meurt le coupable.
Vn stands for a nominalized verb: Cf. III, Ω_0, 1.

1.4. Verbs which are essentially pronominal, i.e. occur in C_2 (s'évader, s'évanouir, s'épanouir): S'épanouissent les roses.

This form of C_3 resembles in form the exclamatory sentences of the type Vogue la galère! and the inverted question center tV - Σ? However, in the inverted question there is no restriction as to which verbs may precede the subject, and the subject is always a personal pronoun.

2. Ω tV Σ: A cette lettre sont joints ces papiers. In this form Σ = Σ_{1-3}, and Ω is as noted in 2.1-2.7 below. Here we note which objects can appear in this position, whether the verb belongs to a particular subclass, and whether the object

itself belongs to a special class. Some of the main cases are:

2.1. Ω = N. N occurs as the object of the verb être and of verbs that can replace être: Un ami demeure Paul. In this position N ($\Omega_{\hat{e}tre}$) can be used without determinants (V, $\Omega_{\hat{e}tre1}$) : Ouvrières sont ces femmes. When it occurs with a determinant, or when it is a proper name or the name of a city, the subject-object inversion yields a center string C_1 (Cet homme est mon ami - Mon ami est cet homme). In this case, it is not always clear that inversion has taken place.

2.2. Ω = A / APN / APV. These occur with the verb être and its replacements: Ronde est la terre, Bonnes à marier deviennent tes filles.

2.3. Ω = Vé Ωé [par / de] N: Envahie de mouches était la côte.

2.4. Ω = PN: En sueur était le cheval, Sur le sucre ont porté ces discussions.

2.5. Locative PN, D, and PD as object or adjunct are frequently used in C_3: De Californie proviennent ces oranges, Ici commence le voyage.

2.6. When Ω_6, Ω_9, Ω_{10} occur in the Ω position in C_3, the verbs belong to particular subclasses of the respective verb classes V_6 (Qu'il pleuve réclamait la foule), V_9 (Le recontrer désirait Paul), and V_{10} (A comprendre ce texte s'efforce Paul.)

2.7. With Ω_3, Ω_5, $\Omega_{5'}$, the verbs are in the pronominal form or else the first N of the object is a pronoun Ω^p.

V_3 ((se) comparer, (s')unir): A Paul [se / te] comparait Jean.

V_5 ((se) croire, (se) trouver): Très belle [se / te] trouve Jane.

$V_{5'}$ ((se) traiter de, (se) considérer comme): Comme heureuse [se / te] considérait Paul.

For example, in V_3 above: The C_1 which corresponds to A Paul se comparait Jean is Jean se comparait à Paul. And the C_1 which corresponds to A Paul te comparait Jean is Jean te comparait à Paul.

3. tV Ω Σ: Seront passible d'amende les véhicules qui.... The form tV Ω Σ is used mainly with a long subject followed by several adjuncts (r_N or r_x): Aurant le tableau d'honneur les élèves qui pendant trois mois ont la moyenne dans toute les matières....

4. Two other possible forms of C_3 are more rare than the preceding ones:

4.1. Ω Σ tV: A cette lettre Pierre ne répondra pas, Comme un ami il considère son chien, Un dur langage il avait, cet homme, Un drôle de nez qu'elle avait, Marie.

4.2. D tV Σ: "Ainsi parlait Zarathoustra." Here D stands for a small subclass of adverbs. D can be analyzed as an adjunct (as it would be if it appeared in a non-inverted form); however D is required in the inverted form: ∄ Parlait Zarathoustra.

Cases with inversions are often similar to exclamatory sentences of the type: Que de bonheurs j'ai vécus! or Qu'il pleuve! voilà ce que réclamait la foule* or they resemble C_5: C'est à Paul que se compare Jean, all of which seem more natural than the examples of C_3.

C_4 =	[Voici/Voilà] N	Voici un schéma.
	N^p [Voici/Voilà]	Le voici.
	Voilà que C_{1-7}	Voilà qu'il pleut.
	[Voici/Voilà] $C_s C_i$	Voici pourquoi Paul est parti.
	Voilà D V Ω	Voilà comment éduquer les enfants.

In more detail the different cases of C_4 are the following:

1. [Voici/Voilà] N, and with N in pronominal form: N^p [voici/voilà].

1.1. N is as described in Σ_1 = N and Ω_1 = N. N can be followed by an adjunct (r_N): Voici Pierre qui rentre. But N does not occur with the right adjunct r_{N6} = que [voici/voilà]: ∄ Voilà le livre que voilà. Some (but not all) of the nouns

* The two sentences in this example were spoken together by the informant with the same intonation as for a single sentence. The part Qu'il pleuve! was seen to be the object of réclaimait, pronounced after voilà, and followed by tV Σ.

in the subclasses N_s or $V_s n$ can appear in C_4 when they are followed by r_{N9} or r_{N10}: Voilà la preuve que Pierre est parti, Voilà une incitation à se révolter, ∄ Voilà la crainte que Paul ne soit parti, ∄ Voilà le besoin de manger.

When N is a noun of measure preceded by Q, en precedes [voici/voilà], or else N is followed by an adjunct: En voilà 10 mètres, Voilà deux heures que je t'attends, ∄ Voilà [10 mètres/deux heures]. Similarly, words of quantity such as: de plupart, beaucoup, peu, cannot appear in the N position unless en precedes [voici/voilà]: En voilà beaucoup. The sequence [du/de la/des] N, meaning "some quantity of N" (cf. Ω_1, 6) can occur in C_4: Voilà du pain. But other sequences of the same form, [du/de la/des] N, which are analyzed as PN, do not occur in C_4: ∄ Voilà de quelque chose.

1.2. When N is a pronoun (N^p) it precedes [voici/voilà], following all the rules noted for Ω^p (IV, Table 1), assuming that [voici/voilà] occupies the position of a verb in C_1: Le voici. En voilà. In addition,

a) $N^p \neq$ lui, leur: ∄ Lui voici.

b) N^p = y, only if there is also another pronoun preceding [voici/voilà]: Nous y voilà, ∄ Y voilà. The pronoun accompanying y in the Ω^p position is most frequently me, te, nous, vous, and only rarely l' or les.

1.3. The different N-replacer strings (described in Σ_2, Σ_3 and Ω_1) may also occupy the N position in C_4, as follows.

a) QU C_1^{-N} (described in Σ_2): Voilà qui est bien. C_4 in this case becomes: [voici/voilà] QU C_1^{-N}. We note that (1) Voilà occurs more frequently than voici; (2) QU ≠ QU que ce soit QU (cf. II, Σ_2); (3) Most frequently QU C_1^{-N} has the value Qui $tV_{\hat{e}tre}$[A/D]: Voilà qui est bien.

b) P QU $C_{1,2}^{-N}$; P QU V Ω:

Voilà avec qui elle veut se marier.

Voilà de quoi réfléchir.

P: sur, de, à, avec. QU: qui, quoi, lequel.

c) Ce QU $C_{1,2}^{-N}$:

Voilà ce qui est important.

Voilà celui qu'elle veut épouser.

2. Voilà que C_{1-7}: Voilà qu'il pleut.

2.1. This form has certain restrictions on que C_1 (e.g. ≠ Voilà que tu es belle est certain), on que C_3 (e.g. ≠ Voilà qu'un drôle de nez avait Paul), and probably excludes que C_4 (≠ Voilà que voilà la pluie).

2.2. The following two forms can be analyzed as related to Voilà que C_{1-7}:
Ne voilà-t-il pas que C: Ne voilà-t-il pas que le chat tombe sur toi.
Voilà ce que c'est (que) de V: Voilà ce que c'est que de faire trop d'efforts.

Alternatively, voilà que and ne voilà-t-il pas que could be analyzed as left adjuncts of a center string C_{1-7}. Another possibility, which is perhaps more consistent with the present overall treatment, is to consider voilà as verb-like and occurring with object que C_{1-7}, in which case ne-pas in Ne voilà-t-il pas que C could be analyzed as the sentence adjunct a_{C1} (but here not carrying the sense of negation).

3. [Voici/voilà] C_s [C_1/VΩ]: Voilà pourquoi Paul est parti; Voilà pourquoi partir. Here, C_s stands for a subclass of C_s that includes où, pourquoi, comment, but not si: ≠ Voilà si Paul est gentil.

4. A few more limited forms of C_4 are:

a) Voici V N_1 / N_1^p voici V: Voici venir le printemps. Le voici venir. Here, N_1 is the subject (Σ_1 or Σ_3) of the infinitive verb. When N_1 is pronominalized (N_1^p) it has the accusative form Ω^p rather than the nominative form Σ^p. It seems that N_1^p = le/la/les is the pronoun most frequently found in this form of C_4, and that venir is the most frequent, if not the only verb, found in this form:
∃ ? Voici descendre la lune, ∃ ? Voici gronder l'orage.

b) Voilà D V Ω: Voilà bien faire du bruit pour rien. Like voici in (a), above, voilà can be followed by VΩ, but the subject of the infinitive verb is not present in the sentence and generally an adverb (bien) occurs between voilà and VΩ.

C_5 = Ce $tV_{\hat{e}tre}$ X QU C_i^{-X}
(where X = Σ, Ω, a_C; and C_i is as noted in 3. below)

1) Ce $tV_{\hat{e}tre}$ Σ qui tV Ω : C'est le chat qui a bu le lait.
2) Ce $tV_{\hat{e}tre}$ Ω que Σ_{1-3} tV : C'est Paul que Marie préfère.
3) Ce $tV_{\hat{e}tre}$ Ω que tV Σ_{1-3} : C'est Paul que préfère Marie.
4) Ce $tV_{\hat{e}tre}$ a_C que C : C'est dans huit jours que je quitterai Paul.
5) Ce $tV_{\hat{e}tre}\left\{\begin{matrix}\Omega_a\\ \Omega_b\end{matrix}\right\}$ que Σ tV $\left\{\begin{matrix}\Omega_b\\ \Omega_a\end{matrix}\right\}$: C'est son coeur qu'elle donne à Paul, C'est à Paul qu'elle donne son coeur.

(where $\Omega_a\Omega_b$ is a two-part object)

In C_5, a part X of a center string C_i appears as $\Omega_{\hat{e}tre}$ (with ce as $\Sigma_{\hat{e}tre}$); the remaining part of the sentence, C_i^{-X}, is found after QU.

1. X = Pro

If X = Pro_p (personal pronoun), then Pro_p = moi, toi, elle, lui, nous, vous, elles, eux. $Pro_p \neq$ je, tu, la, le, les, il, ils. If X = Pro_{ind} (indefinite pronoun), then $Pro_{ind} \neq$ on, tel, aucun, nul. Also, Pro ≠ en, y.

2. X = N

2.1. When X = N (occurring as Σ, Σ^p, Ω, Ω^p, or the N part of Ω), the verb être is always in the singular provided one of the following conditions holds:

a) être is followed by Pro_p = nous or vous: C'est nous qu'il aime.

b) être is followed by a statement of quantity: C'est trois cents francs que coûte cette robe.

c) There are several N's, of which the first is singular: C'est le chat, les poules, et le chien qui se battent.

2.2. The verb être may be either singular or plural when être is followed by a plural N or by Pro_p = elles or eux: [C'est/ce sont] des heures qui paraissent longues. C'est eux qui faisaient du bruit. Ce sont eux qui l'ont raconté.

3. Choice of center C_i

3.1. After QU, the center string C_4^{-X} cannot always occur in C_5: C'est un bel homme que voilà. ≠ C'est qu'il pleut que voilà. ≠ C'est pourquoi Paul est parti que voilà.

3.2. The string C_6^{-X} can occur in C_5 when C_6 = il y a N (C'est un loup qu'il y a ici) and (with several restrictions) when C_6 = il tV Ω: C'est un homme qu'il faut. ≠ C'est qu'il vienne qu'il faut.

3.3. The string C_7^{-X} occurs in C_5 in the form:

$$\text{Ce } tV_{\hat{e}tre}\begin{Bmatrix}\Omega_s\\ \Omega_s\end{Bmatrix} \text{ qui } \begin{Bmatrix} tV_{\hat{e}tre} & N_s/A_s \\ & tV_s\end{Bmatrix}$$

C'est qu'il rentre les foins qui est important.

C'est qu'il le fasse qui surprend Paul.

4. Choice of Ω

4.1. Objects $\Omega_{1,2,4,6,9,10,16,20}$ can be values of Ω in C_5.

4.2. Objects $\Omega_{3,5,7,8,11,12,15}$ are separated into two parts when they occur in C_5, and each part (named Ω_a and Ω_b in variant 5 of the definition of C_5) can generally be inverted: C'est à la chance qu'il attribue son succès, C'est son succès qu'il attribue à la chance.

4.3. Objects $\Omega_{13,14,18,19}$ occur in C_5 with only one part in the X-position: Ce sont les oiseaux que j'écoute chanter, ≠ C'est chanter que j'écoute les oiseaux.

4.4. Ω_{17} (QU C^{-N}) does not appear as Ω in C_5: Jean sait qui est venu, ≠ C'est qui est venu que Jean sait. But Ω_1 (= Σ_2) appears as Ω in C_5: Marie aime qui tu aimes, C'est qui tu aimes que Marie aime.

4.5. $\Omega_{\hat{e}tre\ 1,2,3,5,9}$ can be Ω in C_5: C'est un brigand que sera Paul, C'est en avril que nous sommes.

4.6. $\Omega_{\hat{e}tre\ 8}$ can be Ω in C_5 provided D = locative adverb (C'est ici qu'était Jean) or a subclass of adverbs of time; in the latter case $\Sigma_{\hat{e}tre}$ = il: C'est tard qu'il est, ≠ C'est tard que c'est, ≠ C'est naguère que c'était.

5. In the form of C_5: Ce $tV_{\hat{e}tre}$ Σ qui tV Ω (variant 1 in the definition of C_5), there is an inversion of certain source sentences such that $\Omega_{\hat{e}tre}$ 6 and $\Omega_{\hat{e}tre}$ 7 appear in the position Σ (and $\Sigma_{\hat{e}tre}$ in the position Ω): Le pire est de souffrir → C'est de souffrir qui est le pire, Mon avis est que Paul est gentil → C'est que Paul est gentil qui est mon avis.

6. Also, in cases where in the source C_1 the verb is être, and $\Sigma_{\hat{e}tre}$ = VΩ and $\Omega_{\hat{e}tre}$ = VΩ or A or particular AN/NA, the form of C_5 is Ce $tV_{\hat{e}tre}$ $\Omega_{\hat{e}tre}$ que de VΩ: Vivre est ne pas souffrir → C'est ne pas souffrir que de vivre. Vivre est naturel → C'est naturel que de vivre. Aimer est une douce chose → C'est une douce chose que d'aimer. We also note here a similar form, Ce $tV_{\hat{e}tre}$ N^X que N (where N^X is almost always completed by an adjunct): C'est une personne admirable que Marie.

C_6 = Il y tV_{avoir} N : Il y a quelqu'un.
Il tV_{il} Ω : Il fait du vent.

1. First form of C_6: Il y tV_{avoir} N

The only pronoun which can occur in the position Ω^p is en: Il y en a. When the N following avoir is a common noun and is used without a determinant, it belongs to a subclass of N: Il y a urgence. N may occur with or without adjuncts.

In the N position, we can also have Ω_6 = Que C_i: Il y a que je suis malade. But Que C_i occurs more often after an adverb such as longtemps, peu (Il y a longtemps que je n'ai pas vu Paul) where it resembles C_5 in its effect, or after N_s such as le fait (Il y a le fait que tu ne l'aimes pas), or after time nouns such as un moment, du temps (Il y a un moment que tu n'es pas venu) or after a QN string where N is a unit of time: Il y a dix minutes que je t'attends. Often when Ω_6 occurs there is an adjunct to C_6, such as pour cette raison, comme explication, en fait, en réalité: Comme explication, il y a que je suis malade.

2. Second form of C_6: Il tV_{il} Ω

Here, Σ is il, and the verb is limited to several subclasses (which we have grouped together under the term V_{il}):

2.1. Verbs which are only used in the third person singular are rarely followed by an Ω other than Ω = 0, and, in most cases, describe a natural phenomenon (pleuvoir, grêler, neiger): Il vente, Il pleuvait des coups. This class of verbs includes faire Ω (with appropriate Ω): Il fait froid / beau / du soleil / un temps magnifique.

2.2. Verbs that exist only in the impersonal form (e.g. falloir): Il faut qu'il vienne, Il s'agissait de toi.

2.3. V_{il} such as être, exister, se trouver: Il est sur terre une montagne aride..., Il se trouvera bien quelqu'un pour faire ce travail.

2.4. We could have included y avoir in the subclass V_{il}, thus avoiding the definition of two forms of C_6, but the form Il y a N is so frequent in French that it merits special note. Other verbs can also be used in the impersonal form preceded by il. This case is close to that of C_7, but Ω is more varied than in C_7: Il tombe beaucoup de pluie (i.e. Beaucoup de pluie tombe), Il éclate un orage, Il a été dit que vous ne reviendriez pas, Il est revenu une lettre de toi, Il s'écoula une minute de silence.

$$C_7 = \left.\begin{array}{l}\Sigma_s\ tV_{\hat{e}tre}\ [N_s/A_s]\ \Omega_s \\ \Sigma_s\ tV_s(\Omega)\ \Omega_s\end{array}\right\} : \left\{\begin{array}{l}\text{Il est nécessaire qu'il rentre cela.} \\ \text{C'est un plaisir de le faire.} \\ \text{Ça arrive qu'il fasse ce travail.}\end{array}\right.$$

1) Σ_s = il / ce (c') / ça / cela. (These are the only members of Σ_s.)
2) Ω_s = que C_i (subj) / de V Ω. (These are the only members of Ω_s.)
3) V_s : arriver; servir, nécessiter; étonner, surprendre.
4) N_s : un bien, une évidence, une absurdité, un service, une obligation, une surprise.
5) A_s : bon (bien), évident, absurde, obligatoire, surprenant.

1. The choice of Σ_s depends on the verb and the object, as follows:

1.1. [il/ce/cela] occurs with the verb être followed by $A_s\ \Omega_s$.

1.2. [ce/cela] occurs with the verb être followed by $N_s\ \Omega_s$.

1.3. ça does not occur with the verb être (≠ ça est utile que...)

1.4. [il/ça/cela] occurs with V_s arriver followed by que C. When Σ_s is il and Ω_s is de V Ω, the sentence is generally long: Il arrive de le faire sans qu'on y pense.

1.5. [ça/cela] occurs preferably with V_s other than arriver.

1.6. ce does not occur with V_s (≠ ce arrive que..., ≠ ce sert de...)

2. In Ω_s the subjunctive is not required with words (A/N) that indicate certitude: C'est vrai qu'il est beau.

3. Depending on the choice of V_s, the portion following V_s has the form: Ω_7 = N que C, Ω_{11} = N [de/à] V Ω, Ω_8 = [à/de] N que C, Ω_{16} = QU_{int} C: Ça étonne Paul que tu le fasses, Ça surprend Paul de le faire, Il sert a Paul que tu le fasses, Cela surprend quand il neige.

4. The possibility in C_7 of inverting the sentence (omitting Σ_s, and having Ω_s take the place of Σ) is limited to a V_s subclass, and in some cases requires the addition of adjuncts in order to obtain natural sentences. For example, with V_s arriver: Il arrive que Paul fasse ce travail, Que Paul fasse ce travail arrive parfois, Ça arrive d'avoir des idées, Avoir des idées arrive quelques fois.

5. With N_s, we generally have ce/cela as Σ_s. We can include here an additional subclass of N (N_t) concerning the moment during which the action occurs. N_t such as temps, heure, moment, instant: Il est temps qu'il parte à la gare, C'est le moment de rentrer les foins. But N_t Ω_s cannot be inverted as can $A_s\Omega_s/N_s\Omega_s$: Il est stupide qu'il parte, Qu'il parte est stupide, Il est l'heure qu'il parte, ≠ Qu'il parte est l'heure.

6. A_s and N_s belong to subclasses of A and N which are often related to each other and to certain V_s: Ça surprend qu'il le fasse, Il est surprenant qu'il le fasse, C'est une surprise qu'il le fasse.

The strings C_5, C_6, and C_7 bear a strong resemblance to C_1, and could have been treated as instances of C_1 in which Σ = Ce or il or [Il / ce / ça / cela], V = être, avoir, V_{il}, or V_s, and Ω (for each V) = the portion following V in C_{5-7}, above. This was the policy followed in treating sentences of the type (Le fait) qu'il vienne m'étonne, which are analyzed as instances of C_1 containing one or more of the strings Σ_6, Ω_6, r_{N9}. However, the forms covered by C_{5-7} are more special, i.e. more heavily restricted as cases of C_1, so that it seemed clearer to us to define special strings for these cases. In connection with this question of whether to define new center strings or to bring together all cases similar to C_1, it should be noted that C_6 and C_7 occur in some of the same inverted forms as C_1: Peutêtre

pleuvra-t-il. Peutêtre s'agit-il d'un roman. Sans doute est-ce une erreur qu'il rentre les foins sous la pluie. If C_6 and C_7 were seen as specializations of C_1, we would not have to make special note of their inverted forms.

C_8 Question

The question centers are different arrangements of the parts of the assertion center. The simplest form consists of one of the centers C_1 through C_7 followed by a question mark: Le garçon porte la valise? Other forms are:

1. Inversion of subject and verb: $tV\text{-}\Sigma^p\ \Omega$?: Portes-tu la valise?

1.1. $\Sigma^p = Pro_p$ or N determined by le, la, les, or N as a proper noun (pronominalised).

1.2. If the verb ends in [a/e], -t- is inserted between tV and Ω^p (Pro_p in the third person singular): Porte-t-il la valise? In the first person singular, some verbs cannot be used in this form: ≠ Cours-je? ≠ Songé-je?

1.3. There are three positions for Ω^p:

a) $[\Omega^p/N^p]tV\text{-}\Sigma^p[Vé/\Omega^{-X}]$: La portes-tu? S'est-elle lavée? En as-tu mangé? La feras-tu réparer? Les écoutes-tu chanter? This position of Ω_p is the most common. Here $X = N_1/$que C/V Ω. N^p indicates that N_1 (the subject of the infinitive verb) in Ω_{13} and Ω_{14} also occurs in this position. The two pronominalised parts of an Ω can precede tV. For example, with Ω_{15}: L'y encourage-t-elle? (e.g. Elle encourage l'enfant à nager.) When they appear here, the objects $\Omega^p_{1\text{-}8,11\text{-}13}$, $\Omega_{18,13}$ are pronominalised in parts Que C and V Ω.

b) $tV\text{-}\Sigma^p[à/de]\Omega^p$ V: Vas-tu le voir? Doit-il y penser? Commence-t-il à le comprendre? Viens-tu de le voir? This position of Ω^p is due to $\Omega_9 = \Omega^pV$, and to $\Omega_{10} = [de/à]\Omega^pV$.

c) $tV\text{-}\Sigma^p$ Vé $[à/de]\Omega^p$ V: Es-tu allé le voir? A-t-il commencé à le comprendre? This is found when verbs having Ω_9 and Ω_{10} are conjugated with être or avoir.

1.4. When $\Sigma = N$ is explicitly named, it is repeated after the verb by the pronominal form (Pro_p) that corresponds to it. We define this case with the formula $N\ tV\text{-}\Sigma^p\ \Omega$?: Le chat a-t-il mangé la viande? The same form occurs when N is a

pronoun of any one of the three types represented by le mien, celui-ci, quelqu'un: Cela se produit-il souvent? When the position of N in this formula is occupied by a string Σ_{2-5} we have Σ_{2-5} tV-Σ^p Ω ? When in this formula $\Sigma = \Sigma_2$, Σ^p is a pronoun in the third person: Quiconque téléphone dérange-t-il Marie? When $\Sigma = \Sigma_3$, Σ_4 or Σ_5, Σ^p is il (neuter): Ce que Pierre pense révolte-t-il sa femme? Où Marie a rangé le linge a-t-il de l'importance? Qu'il vienne est-il souhaitable?

1.5. Inversion of C_5, C_6, C_7

a) C_5 beginning with Ce tV$_{\hat{e}tre}$ permits the inversion of ΣV: Est-ce le chat qui a mangé la viande?

b) For C_6 and C_7, the order verb-subject is possible if Σ_s = ce/il: Est-ce utile qu'il le fasse? Pleut-il? Arrive-t-il que la pluie cesse? ≠ Arrive-cela que...?

2. QU C_8^{-X} (where C_8 stands for the inverted forms defined in 1.1-1.5 above, and X is as noted in 2.1-2.5 below).

2.1. QU_{int} = quand, où, pourquoi, comment, combien question an adjunct of the center string (a_c) or a particular object (N of place, of time, of quantity, D of manner). The form is QU_{int} $C_8^{-a_c/\Omega}$: Pourquoi dis-tu cela? Où va Pierre? Combien as-tu gagné?. Quand and où can be preceded by the preposition de: De quand date le journal? D'où vient ce train?.

2.2. QU = qui, que, lequel (masc/fem, sing/pl) question an N occurring as Ω_1 or as part of an Ω. The form is QU C_8^{-N}: Que porte Pierre? Qui penses-tu rencontrer? Laquelle crois-tu qu'il aime? Note that QU = qui implies that the N in question is a person. When the N in question is $\Omega_{\hat{e}tre}$ we have a slight difference: QU = qui, que, quel (masc/fem, sing/pl): Que suis-je? Qui est cet homme? Quel est cet objet?

2.3. QU = que, or P QU = de quoi questions the following object strings: Ω_6 (que C), Ω_9 (V Ω), Ω_{10} (de/a V Ω), Ω_{16} (C_s C), Ω_{17} (QU C^{-N}), or equivalent parts of other Ω (for example, in Ω = à N de V Ω, the part: de V Ω). The form is (P) QU $C_8^{-\Omega}$: Que dit Paul? (e.g. que tu es gentille). De quoi parle-t-il? (e.g. de se tuer). Que cherche-t-il? (e.g. à joindre Paul).

2.4. P QU = auquel, duquel (masc/fem, sing/pl), P qui, P quoi, P lequel (masc/fem, sing/pl); P: à, de, sur, dans, pour, avec. This form questions a PN (Ω_2) or a PN part of an Ω. The form is P QU C_8^{-PN}: A qui parlait Paul? Duquel disais-tu qu'il s'était inspiré?

2.5. [combien de / quel N] (where quel agrees with N) questions an adjunct of N ($\ell_N/r_N/a_N$); or else quel N represents a general or classifying word. N is Ω_1 or is part of Ω. We also have [P quel N/P combien de N]. The form is (P) [combien de / quel] N C_8^{-a}N : Combien de valises portes-tu? Quel objet porte Paul? A combien de femmes a-t-il dit qu'il les aimait? The part de N can be in the form Ω^p (en): Combien en portes-tu? or after tV-Σ^p: Combien portes-tu de valises?

3. QU forms without inversion

3.1. QU = qui, lequel (masc/fem, sing/pl) and, quite rarely, quoi, serve as Σ in the question QU $tV^{-\Sigma}$?: Qui porte la valise?

3.2. [Quel N / combien de N] pose a question about N occurring as Σ_1. The word order is the same as in C_2 and nothing is missing in the sentence.* N is a general or classifying word. The form is [Quel / combien de] Σ_1 tV Ω?: Quelle personne a téléphoné à Paul? Combien d'élèves assisteront au cours? With combien, the question is about un nombre de N, and de N is sometimes zeroed as in Combien assisteront au cours?

4. The particle Est-ce que serves to mark the formation of a question about an entire sentence.

4.1. Est-ce que C_{1-7}?: Est-ce que le garçon porte la valise? Est-ce que qu'il s'évadera? Est-ce qu'à cette lettre sont joints ces papiers? Est-ce que c'est Paul que Jeanne préfère? Est-ce qu'il y a quelqu'un? Est-ce que ça arrive qu'il pleuve? Verbs that do not allow the order verb-subject in the first person singular are used in this interrogative form: Est-ce que je cours?

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* In other words $C_1 = \Sigma$ tV Ω is complete, but it is likely that ℓ_N of the type sorte de, type de, nombre de, quantité de, and determinants of N such as plusieurs, quelques, certains, and numerals do not occur here.

4.2. Est-ce que also occurs with QU words and is found to their right (qu'est-ce que). The order subject-verb is maintained. Est-ce qui occurs with QU in the form QU tV $\Omega^{-\Sigma}$: Quand est-ce que tu verras Paul? Qu'est-ce que tu portes? Quel objet est-ce que tu portes? Qui est-ce qui porte la valise?

5. An interrogative form with the verb in the infinitive exists:

N, V ? : Lui, revenir?
V, N ? : Revenir, lui?

If N = Pro_p, then Pro_p = moi, toi, lui, elle, nous, vous, elles, eux. V may be preceded (sometimes followed) by the marks: QU_{int}, QU, P QU, (P) [quel / combien de] N, but not est-ce que: Où aller? Que faire? A qui dire qu'il est fou? Quelle robe choisir? A combien de personnes avouer cela? ≠ Est-ce que Pierre revenir? ≠ Que est-ce que faire?

$C_9 = C_1^{-\Sigma}!$: Finissez! Partons d'ici!
N, tV Ω! : Toi, sois sage! Pierre, regarde cet oiseau!
Que C_1! : Qu'ils finissent ce travail!
N, que C_1! : Lui, qu'il se taise!

The forms $C_1^{-\Sigma}$ and N, tV Ω only exist in the second person (tu, vous) and in the first person plural (nous). The pronominalised object is always after the verb; there is no Ω^p: Dis-le à Paul! Donnez-m'en! ≠ Le dis à Paul! N is rarely the name of a thing (as opposed to a person). The verbs être, avoir, savoir, vouloir take the subjunctive. The form Que C (and N, que C) is in the subjunctive.

C_{10} Exclamation (sketched briefly)

In exclamations, the word order is similar to that in C_3 or C_8. The sentence is followed by an exclamation point (!). Some of the forms are:

1. tV Σ ! In the subjunctive the verb expresses a wish. These sentences are idiomatic expressions: Vogue la galère! Vive la République!

2. tV Σ Ω! The verb être is in the indicative and not all $\Omega_{être}$ occur: Est-ce beau! Est-il nigaud!

3. Quel tV Σ! Quel N Σ tV! With quel (masc/fem; sing/pl) the verb is être:

Quelle est son audace! Quel chapeau il porte! Quelle audace il a!

4. Ω tV Σ! When Σ = Pro_p and the sentence includes a negation: Cette lettre ne l'as-tu pas relue 100 fois!

5. In other cases we have C_1 = Σ tV Ω, followed by "!" and often preceded by comme, combien, que : Que c'est beau! Comme il y a du monde! There are also exclamations without a verb in the form Quel N!: Quelle fille! Quel courage!

II. SUBJECT STRINGS: Σ

Σ_1 = N Le garçon mange la pomme.

Several different cases of Σ_1 can be distinguished.

1. Σ_1 = N, where N is a noun preceded by a determinant* which agrees with the noun (masc/fem, sing/pl):** le/la/les, un/une/des, ce(cet)/cette/ces, mon/ma/mes (and similar ton/ta/tes, etc.). Among the so-called indefinite adjectives A_{ind}, some do not occur preceded by a determinant (and are here considered to be the determinant): J'aime certaines villes, ∄ J'aime des certaines villes. The A_{ind} of this type are: quelque, certains (pl), plusieurs, maint(e)(s), (archaic form of plusieurs), chaque, aucun(e)(s), nul(le)(s), pas un(e), different(e)(s), divers(es). Other A_{ind} can occur as an adjective preceded by a determinant (in which case they can be analyzed as ℓ_N) or as a determinant: J'aime une certaine ville, Je pourrais vous répéter certaine chose. The A_{ind} of this type are: certain(e), quelques, tout (masc/fem, sing/pl), autre(s).

The noun can also be preceded by a number instead of a determinant. When N is preceded by a number and a determinant (ces 50 élèves sont reçus) we take the number as left adjunct of N (ces élèves sont 50). But when no determinant precedes the number, we take the number itself to be the determinant (cf. VII, ℓ_{N1}). The same remark applies to A_{ind} preceded by a determinant. But note that in the case of A_{ind} N there is no corresponding sentence N is A_{ind} (∄ Les femmes sont toutes) except for tel and autre (Telle est mon opinion, Mon opinion est autre).

1.1. In the term "noun," we include the compound noun, although these can be analyzed further as noun strings appearing in the same positions as nouns. The most common forms are: N-N (chou-fleur), A-N (rouge-gorge), N-A (coffre-fort), V-N (cache-nez), P-N (sous-marin), A-A (sourd-muet), N-P-N or two words united by

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* The words which are called "determinants" in this paper are those which cannot be excised leaving a complete sentence (cf. Part 2, below). From the point of view of axiomatic string analysis, these words can be considered restricted left adjuncts of N.

** The plural marker is generally -s but it takes other forms for special subclasses. As with verb endings, we will not enter into the question of morphophonemics here. For the plural marker in compound nouns, see Note 1, at the end of the chapter.

P (pied-à-terre, tout-à-l'égout), N composed of diverse elements (un brise-tout, un gagne-petit, un méli-mélo, un passe-passe, la plus-value), a compound N without hyphen: NA (garde mobile), NPV (tabac à priser), NPN (pomme de terre). (See Note 1 at the end of the chapter.) In the term noun, we also include the string N_1 N_2 where N_1 is a title and N_2 a proper name (Monsieur Durand) and certain double nouns for specialized professions (médicin phychiatre, mécanicien lyno). The two nouns N_1 N_2 agree.

1.2. Agreement. In general the verb of the center string agrees in number with Σ_1 = N. Certain verbs require that Σ_1 have as value either a collective or plural N or else the sequence N [et/avec/à] N: La troupe se rassemble, Les hommes se rassemblent, Marie et Pierre se sont rencontrés, ≠ Un homme se rassemble. (A corresponding restriction on Ω_1 = N is noted in III, Ω_1, 5.1.) When a singular collective N is preceded by a determinant of the type le/ce/mon, the verb agrees with N, even if N is followed by a plural adjunct de N: La foule des badauds nous empêchait de voir l'accident. However, if the collective N is preceded by un/une, the agreement is either with the singular collective noun or with the plural de N: Une foule de manifestants arrivait gare de Lyon, Une multitude de villes ont été détruites.

The verb is always plural when N is preceded by an adverb of quantity D_q de (beaucoup de, bien des, une infinité de, peu de): Peu de gens comprennent la situation. When de N is absent, certain of these D_q occurring as the subject (cf 6. below) require a plural verb: La plupart remettent la société en cause.

2. Σ_1 = N, where N is a proper noun or the name of a city without determinants: Marcel porte un chapeau, Paris est une grande ville. In certain cases, an N which is the name of a city or is a proper noun is preceded by a definite article (2.1-2.4); other N are determined except as noted in 2.5.

2.1. When N denotes all the members of a family having the family name N, it is preceded by les: Les Durand partent en vacances.

2.2. The article is part of several names of cities, old common nouns, and proper nouns: Le Hâvre, La Fontaine.

2.3. It is customary for the definite article to precede the name of certain artists: La Callas, l'Arioste.

2.4. The article is used when the proper noun is preceded by an adjective:

Le gentil Nicholas se mit à pleurer. A question then arises as to what is the left adjunct of N. If one accepts only A (gentil), then the article (le) remains in the center string (Le Nicholas se mit à pleurer); alternatively, le A (le gentil) could be analyzed as ℓ_N.

2.5. The other N are, in French, almost always determined. We note here several cases where N can be used without determinants:

a) In proverbs: Pierre qui roule n'amasse pas mousse; and in titles: Batailles dans la montagne.

b) In apostrophes: Enfants, taisez-vous!

c) In apposition: Paris, capitale de la France, est une ville touristique.

d) In certain enumerations: Tulipes, anémones, narcisses fleurissent à la même époque.

e) After verbs such as avoir, donner, faire, prendre, when N forms a single entity with V and the two words are then equivalent to a new verb: avoir peur, faire honte, prendre feu.

f) After certain prepositions for particular subclasses of N: une table de bois, agir avec courage, être en pleurs.

g) When N is close to an adjectival expression: Jeanne est femme jusqu'au bout des ongles.

h) In interrogative or negative sentences of exclamative value: Est-il tableau plus joli que celui-ci?, Je crois que jamais homme n'a été si grand.

3. Σ_1 = Pro: Je mange une pomme.

3.1. If $\Sigma_1 = Pro_p$ (personal pronoun), then $Pro_p \neq$ me, te, se, le, la, les, leur, soi.

3.2. If $\Sigma_1 = Pro_d$ (demonstrative pronoun) and if Pro_d = celui, celle, ceux, celles, then Pro_d is followed by one of the adjuncts:

PN: Celles de la Grèce sont réputées.

PD: Ceux d'ici semblent meilleurs.

Vé Ωé [par/de] N : Celle donnée par Paul n'a pas duré longtemps.

QU C^{-N} : Celui dont on parle est inconnu.

Otherwise these words (celui, celle, ceux, celles) appear in the composite form (i.e. followed by the suffix -ci or -là): Celles-ci sentent bon. The other

demonstrative pronouns: ce (c'), ceci, cela, ça, appear alone: Cela arrive tous les jours.

3.3. If $\Sigma_1 = Pro_{ind}$ (indefinite pronoun) and if Pro_{ind} = aucun, pas un, nul, rien, personne, then ne must be present in C_1: Personne ne parle des évènements. The indefinite pronoun autrui is never in the subject position. The pronouns en and y are also not subjects.

4. $\Sigma_1 = N_1\ P\ N_2$: Le port du chapeau est obligatoire.

4.1. Using the excision method, it is sometimes difficult to isolate $P\ N_2$ (generally de N) as a right adjunct of N_1, as for example in L'approche des côtes est dangereuse, and in La prise de conscience évite ces erreurs. The most frequent case is the one in which N_1 comes from V in V Ω and N_2 is the object of V (porter un chapeau, approcher des côtes, prendre conscience). These verbs always require an object when they occur in the form Σ tV Ω: Jean porte un chapeau. A refined string grammar could treat these cases of $N_1\ P\ N_2$ by defining a string Vn P N. There are also other sources for difficult $N_1\ P\ N_2$ excisions, e.g. taux d'oxydation.

4.2. Various N A are similar to the N P N of 4.1 in that it is difficult to separate the A from N, e.g. battements ciliaires, phosphate inorganique, façon continue.

5. $\Sigma_1 = Q\ N_m$: 50 métres sont vite courus. Here Q is a number and N_m is a noun of measure: métre, kilo, litre, franc).

5.1. N_m is generally preceded by Q but in particular environments may occur with another determinant (e.g. le, un, ce, quelques): Le métre est une mesure, Ce kilo est en trop.

5.2. $\Sigma = Q\ N_m$ occurs with a small subclass of verbs (être, paraître, sembler, faire) or with verbs of measure (durer, peser, (se) mesurer, (se) compter, (se) depenser, (s') ajouter, (se) retroucher).

300 francs paraissent insuffisants pour cet achat.
300 francs se depensent vite.
300 francs durent longtemps.
Cet arbre a 10 métres de haut.
Cet arbre mesure 10 métres.

Cet arbre coute 300 francs.

Cet arbre durera 30 ans.

5.3. In the spoken language one may find a plural Q N_m subject occurring with a singular verb: 10 métres paraît peu pour une piscine. However, the more common form for a sentence of this type would be: 10 métres cela paraît peu pour une piscine.

5.4. Q N_m also occurs as the object of verbs of measure: Il pèse 22 kilos.

5.5. In certain cases when Q N_m is followed by de N ($N \neq N_m$), e.g. 10 kilos de raisins, it may be preferable to analyze Q N_m de as a left adjunct of N. This would be the case in, e.g., 10 kilos de raisins sont gâtés, if we are aiming at a refined analysis in which the center string corresponds to an elementary sentence or transformational analysis: Raisins sont gâtés, ≠ 10 kilos sont gâtés.

6. $\Sigma_1 = D_q$

In position Σ_1 we have adverbs of quantity D_q (beaucoup, peu, combien, pas mal, davantage): Beaucoup pensent que nous avons tort. De N is understood (i.e. zeroed) and is either a general or classifying noun, or else is given by the context: Beaucoup (de gens) pensent..., Elle a acheté plusieurs robes, peu sont jolies. Certain of these adverbs occur as $\Omega_{\hat{e}tre}$ (Ils sont beaucoup). Similarly, a number can appear as Σ or Ω where an N (zeroed) is understood: Elle a acheté trois robes, deux sont jolies.

7. A, D, P, as well as N and V, in treatises on language and grammar, may be used as Σ_1 without a classifying word or quotation marks: Beau est l'opposé de laid, En est une préposition, Où prend un accent, Courir se conjugue à tous les temps.

Σ_2 = QU $C_{1,2}^{-N(\Sigma)}$: Qui tV : Qui dort dîne.

Quiconque tV : Quiconque viendra ici sera le bienvenu.

(where QU = qui, quiconque, n'importe [qui/lequel], and $-N(\Sigma)$ indicates that the subject N of $C_{1,2}$ has been replaced by a pronoun incorporated in the QU-word).

QU que ce soit QU $C_{1,2}^{-N}$

(where QU = qui, quoi, n'importe [qui/quoi]).

In greater detail the forms of the latter variant are:

1) Qui que ce soit qui tV Ω: Qui que ce soit qui lui téléphone dérange Marie.
2) Quoi que ce soit qui tV Ω: Quoi que ce soit qui se produise étonne toujours Marie.
3) Qui que ce soit que Σ tV: Qui que ce soit que Pierre aime rend Paul jaloux.
4) Quoi que ce soit que Σ tV: Quoi que ce soit que Jean fasse rend Marie heureuse.

There is also the form Qui Σ $tV^{-\Omega}$ (Qui Paul aime, aime Jean) but this is less natural.

Σ_3 = Ce QU $C^{-N}_{1,2}$

Ce qui tV Ω: Ce qui est arrivé hier était une lettre pour toi.
Ce [que/dont] Σ tV: Ce que Jean a raconté interesserait Paul.
Ce [que/dont] tV Σ: Ce que pense Pierre révolte sa femme.

1. Instead of defining Σ_3 we could treat the form Ce QU $C^{-N}_{1,2}$ as a case of Σ_1. We noted in Σ_1 = N the case of the demonstrative pronouns Pro_d = celui/celle/ceux/celles: When they are not used in the composite form (e.g. not as celui-ci, etc.), they must be followed by an adjunct. To treat ce similarly we would have the following rules: If ce occurs without an adjunct, the verb of the center string must be être; otherwise, ce must be followed by an adjunct, in particular the right adjunct QU C^{-N}: Ce dont on rêve se réalise parfois, ∄ Ce de la Grèce est réputé.

Alternatively, we could consider those Pro_d which require an adjunct as a case of Σ_3, and only include in Σ_1 the Pro_d in the composite form (such as celui-ci) and ceci, cela, ça. We would have Σ_3 = CE M_{ce} (where M_{ce} indicates the necessity of a right adjunct of CE = ce/celui/celle/ceux/celles). Another possibility would be to note in r_N that there is an automatic transformation on N = Pro_d after the excision of its right adjunct, i.e. Ce → ceci/cela; celui → celui-ci, etc.

2. Σ_3 appears with the same predicates V_s Ω, être $[A_s/N_s]$ as does Σ_6, but

with others as well: Ce qu'il écrit est réputé.

NB: The two strings Σ_2 and Σ_3 almost always appear in the same positions as N (Σ_2 much less frequently than Σ_3). When we wish especially to signal this fact, we will designate them as "N-replacements" N_r ($N_r = \Sigma_2/\Sigma_3$); otherwise it will be understood henceforth that N represents a real N or a string N_r.

$\Sigma_4 = [QU_{int}/si]\ C$: Où Marie a rangé ses chemises intrigue Paul, Pourquoi les ouvriers continuent la grève étonne les gens, Quand Jean reviendra n'est pas important.

(where QU_{int} = quand, où, pourquoi, comment, combien).

If the verb of the center string is of the type être, sembler, paraître, then the object A or N belongs to the subclass A_s or N_s, respectively (important, intéressant, imprévisible, une question, une inconnue, une riposte). If the verb of the center string is avoir, then the object is de N of the type: de l'importance, de l'intérêt, du sens. Other possibilities for the verb are the same as noted for Σ_6, and imply the same restrictions on Ω = N. This string is the same as Ω_{16}.

$\Sigma_5 = V\ \Omega$: Regarder le soleil brûle les yeux, Se souvenir de son enfance fait sourire, Vivre est naturel.

1. In C_1, when $\Sigma = \Sigma_5$, it seems that the objects Ω_5 = NN/NA, $\Omega_{16} = C_sC_i$, Ω_{17} = QU C^{-N}, Ω_{18} = A que C, Ω_{19} = A de V do not occur as the object of the infinite verb of Σ_5.

2. Only particular subclasses of verbs within each class V_i which occurs with a particular object Ω_i occur with the subject $\Sigma = \Sigma_5$. For example, if $\Sigma = \Sigma_5$ and $\Omega = 0$ then V_0 = exalter, transporter, effrayer, but $V_0 \neq$ exister, naître, mourir, lire, écrire: $\not\#$ Regarder le soleil existe.

Σ_6 = que C_{1-7} : Que tu es belle est certain, Qu'il vienne ici étonne Paul, Qu'il soit urgent de finir ce travail empêche Paul de sortir.

In the first example the verb occurring with Σ_6 is of the type être, sembler, paraître and $\Omega_{\hat{e}tre}$ belongs to a subclass A_s or N_s (certain, sûr, probable, vrai,

incroyable, une certitude, un fait, une supposition). In the second example the main verb belongs to a subclass V_s (étonner, intéresser, passionner, surprendre, prouver, montrer) whose object N has restrictions on it: Qu'il porte la valise prouve sa bonne volonté, Qu'il ne bouge plus inquiétait le chien, ∄ Qu'il porte la valise [prouve/étonne] la table.

Σ_6 occurs as the subject of a number of subclasses of verbs appearing with $\Omega_{3,6,7,8,10,11,14,15 \text{ and } 17}$ (such as: priver, réduire, permettre, avertir, expliquer, apprendre, empêcher, accuser, menacer, révéler, faire): Qu'il vienne ici prive Jean de sortie, Qu'il ait mangé tous les gateaux fait pleurer le bébé.

Note 1: Plural forms of compound nouns.

1. Compound nouns in bound form.

Like other nouns these accept the plural marker: un portemanteau, des portemanteaux; un malhonnête, des malhonnêtes. Several undergo an internal change: monsieur, messieurs; mademoiselle, mesdemoiselles; un bonhomme, des bonshommes.

2. Hyphenated compound nouns.

Below we indicate in parentheses the position of the plural marker in the most common forms of compound nouns of this type. When one of the elements is followed by a plural marker which is not inclosed in parentheses, it is because this part of the expression is invariable.

a) The plural marker is applied to all of the elements when the noun is formed by:

N-N chou(x)-fleur(s), garde(s)-côte(s) (when garde denotes a person: des gardes-côtes ≈ les personnes qui gardent les côtes).

N-A pied(s)-bot(s), chasseur(s)-alpin(s).

A-N rouge(s)-gorge(s), court(s)-circuit(s), grand(s)-père(s).

A-A sourd(s)-muet(s).

A-Vé nouveau(x)-venu(s), premier(s)-né(s).

b) The plural marker is applied to one element (N):

P-N en-tête(s), entre-ligne(s), sous-chef(s).

D-N haut-parleur(s).

and in certain cases, when the noun is formed by:

N-N hôtel(s)-Dieu, timbre(s)-poste, garde(s)-chasses.

A-N grand-mère(s), grand-route(s). (When grand is part of a feminine composite word, it remains invariable.)

V-N tire-bouchon(s), garde-robe(s), garde-côte(s) (when garde denotes the verb garder, garantir: des garde-côtes ≈ les bateaux qui servent a garder les côtes.)

N-P-N maître(s)-d'armes, maître(s)-de-forges...

c) No plural marker:

Pro-V un/les on-dit.

V-V un/des laisser-passer.

V-P-N un/des meurt-de-faim.

and in certain cases where it is formed by:

N-P-N un/des goutte-à-goutte, pied-à-terre, coq-à-l'ane.

V-N un/des brise-glace, porte-monnaie, garde-boue, garde-feu.

d) Invariable compound nouns of which one of the elements (N) is always plural:

V-N un/des brise-lames, compte-gouttes, porte-cigarettes, porte-avions, porte-bagages, garde-mites, garde-notes, garde-riens.

3. Non-hyphenated compound nouns:

N A garde(s) forestier(s), garde(s) mobile(s).

N P N char(s) d'assaut, chasseur(s) à pied, pomme(s) de terre.

N P V tabac(s) à priser.

III. OBJECT STRINGS: Ω

The notation $V_j\ \Omega_j$ $(0 \leqslant j \leqslant 20)$ is used to indicate that a particular verb subclass V_j occurs with a given object string Ω_j. Thus, V_1 is the subclass of verbs which occurs with a noun object (Ω_1 = N), V_2 is the subclass of verbs which occurs with a prepositional phrase as object (Ω_2 = P N), etc. In this paper, twenty object strings are presented. Within each V_j class there may be further subclassification.

$\Omega_0 = 0$: Le soleil disparaît, Jean meurt, Le chat boit.

1. A null object ($\Omega = 0$) occurs with intransitive verbs (disparaître, naître, exister, végéter) and essentially pronominal verbs (s'évanouir, se suicider, s'évader), for which se does not have the function of Ω (cf. C_1, 1.2). A small class of verbs which are usually intransitive (rêver, vivre, mourir) sometimes occurs with a special Ω formed by nominalizing the verb: rêver un rêve, vivre une vie.

2. Verbs of motion or position (marcher, glisser, romper) occur with $\Omega = 0$ and sometimes with Ω = D: marcher vite (D can alternatively be analyzed as r_V.)

3. Another subclass of verbs (parler, croire, triompher) occurs with $\Omega = 0$ or with a characteristic P N object: parler à quelqu'un.

4. A subclass of transitive verbs (lire, écrire, cuisiner) often occurs without Ω, due to what is called (in transformational terms) deletion. One can show that an N object has been zeroed because the sentence is equally acceptable when the zeroed N is supplied: Je lis, Je lis [des livres/des journaux]. The zeroed N belongs to a subclass of the acceptable noun objects of the given verb. For example, there is no deletion in lire l'avenir, lire la pensée de quelqu'un, lire les lignes de la main.

5. A small class of verbs (aimer, voir, être) usually occurs with an Ω but can occur without Ω in assertions having an absolute sense: Je suis, L'homme voit. This case differs little from that of deletion.

6. Verbs which occur as tV both in N_1 tV N_2 and in N_2 tV (casser, accélérer, gonfler, cuire) occur in N_2 tV with $\Omega = 0$: Je casse un verre, Le verre casse.

$\Omega_1 = N$: Paul aime Paris, Le bucheron abat les arbres, Jean la regarde, Jeanne épluche des choux-fleurs, Paul aime qui tu aimes, Marie admire ce que tu fais, Marie sait quoi faire.

Like Σ_1 (= N), Ω_1 = a proper name or city name without determinants, a common noun with determinant, a pronoun, a compound noun, a sequence N_1 P N_2, or, for certain subclasses of verbs, N_s with or without r_{N9} (Cf. II, Σ_1, 1-2, 4-7). Ω_1 can also be a noun-replacement string N_r as described in $\Sigma_{2,3}$. In object positions, i.e. in Ω_1 and in N of P N, there is an additional N_r string QU V Ω (QU = qui, quoi, que), which does not occur as Σ: Marie sait quoi faire. We note the following restrictions on Ω_1:

1. If N = Pro, then Pro ≠ je, il(s), elle(s), on, tel, nul.

2. If Ω_1 = aucun or pas un, then n'en must occur in C_1: Je n'en porte aucun.

3. If $\Omega_1 = Pro_{ind}$ of the negative type (rien, personne), then ne must occur in C_1: Je ne porte rien.

4. If Ω_1 = an expression of the type un autre, des autres, certains, plusieurs, then en must occur in C_1: J'en porte plusieurs. Note that Ω_1 ≠ beaucoup, la plupart, peu: ∄ J'en aime beaucoup.

5. Restrictions on Ω_1 due to subclasses of V_1 in V_1 Ω_1 :

5.1. A particular subclass of verbs requires a plural or collective N as value of Ω_1 : Jean réunit ce couple, On rassemble le troupeau, Jean collectionne les timbres, ∄ Jean réunit Paul, ∄ Il collectionne le timbre.

5.2. With measure verbs such as valoir, peser, coûter, durer, Ω_1 = a phrase of measure: Le voyage durera une heure, Elle pèse dix grammes.

5.3. Certain object nouns change the meaning of the verb, and in such cases no passive transformation is possible: Jean sent l'oeillet (≈ Jean sent comme l'oeillet) ≠ L'oeillet est senti par Jean; whereas: Le chien sent la viande qu'il va manger → La viande est senti par le chien. Further examples of Ω_1 of this type are: sentir le sapin, respirer la vengeance, embaumer la truffe, faire son chemin, manger ses mots, voir le jour. Similar examples where Ω = P N are: tomber dans les pommes, filer à l'anglaise, manger de la vache enragée. One could analyze these cases as containing a new verb consisting of the sequence V N or V P N instead of as a verb V with restricted object N or P N. We find similar occurrences of V A (where A occurs adverbially): voir clair, boire sec, couper court, filer doux.

6. There are several subclasses of N which are preceded by du/de la/des, chiefly abstract and mass nouns: Cette femme a de la noblesse, Jean éprouve du remord, Cette citerne contient de l'essence. Some nouns can be used in this way and can also occur as countable nouns: Jean achète [du pain/de la salade], Jean achète [un pain/deux salades]. In all of these cases, N can occur with a determinant other than du/de la/des when it occurs with an adjunct: Cette femme a la noblesse de son père, Jean éprouve le remord d'avoir volé, Cette citerne contient [une essence rare/ l'essence de réserve], Jean achète le pain pour ce soir. It should be noted that if there is negation, [du/ de la] → de : Cette femme n'a pas de noblesse, Jean n'achète jamais de pain. These subclasses of N also occur with il y a and in the form Ω^P = en : Il y a du pain dans la maison, Il y'en a.

Ω_2 = P N : Jean parle [à/ avec/ de] Paul, Marie pense à ce qu'elle fera demain, Le train arrive à Lyon.

1. The object is introduced by a preposition P chosen according to the particular verb. Some verbs occur with a small set of P whereas other verbs always occur with the same P: s'abstenir de, accéder à, s'étonner de, opter pour, renchérir sur, douter de. We have defined P N as an object string in all cases of V P N (where P N is not an adjunct string) although P is sometimes part of V or changes its meaning.

2. Some verbs, according to the meaning, have either Ω = N or Ω = P N : Ils applaudissent ce spectacle, Ils applaudissent à cette décision.

3. Several prepositions impose restrictions on N; e.g. parmi is followed by a plural or collective noun: Elle se trouve parmi {les manifestants/la foule}; entre is followed by a plural N or by N et N: Il faut choisir entre la peste et le choléra.

Ω_3 = N P N : Ils attribuent leurs succès à la chance. On distingue ces jumeaux à ce que l'un est blond et l'autre roux.

P N N : On démontrait à Paul son égoisme.

The verbs V_3 which occur with Ω_3 are of several subclasses. For example:

1. The subclass of V_1 noted in Ω_1, 5.1 (mélanger, comparer, relier, unir, rassembler, collectionner) often occurs with Ω_3 and in the pronominal form se V (where se = Ω^P): On compare Paul à Jacques, On mélange le blanc avec le rose, Jean se compare à Pierre. Prepositions which are common in this form (depending on the verb) are P = à, entre, avec, de. We could also allow et as P here: On réunit Pierre et Paul, On mélange le vin et l'eau.

2. Another subclass of verbs (menacer, engager, astreindre, contraindre, pousser, obliger, priver, réduire) occurs with Ω_3 and with Ω_{11} (N [de/à] V Ω) : Jean menace Paul d'une fessée, Elle prive l'enfant de sortie, Ils réduisent ce pays à la famine. Here P = à, de, and N_2 (in N_1 P N_2) often belongs to a subclass which is particular to the given verb. N_2 may be a nominalized verb Vn (fuite, sortie, travail, course, voyage) or a member of such subclasses as are illustrated by (1) dessert, bonbon, bal, prison; (2) tristesse, joie, tendresse. $N_1 = N_{animate}$ or N such as pays, ville, état, groupe, communauté.

3. There is a large subclass of verbs that occurs with N_1 P N_2 in the Ω position (usually P = à) and also with $\Omega = N_1$. In other words, one can excise P N_2 as is the case with any other adjunct. We have classified these P N (= indirect object) as adjuncts of the verb (a_{V_1}): Il écrit une lettre à Pierre, Il écrit une lettre. However, there are cases where the excision is delicate, as for example with the verbs perdre, dépenser, passer when N_1 belongs to one of several special subclasses of N (temps, énergie, force, santé; argent, monnaie, économies; nuit, heures, année): Il perdra sa paye aux courses. These would seem to be a shortened form of a_{C12} (XII, a_{C12}).

Ω_4 = A/N : Cela demeure stupide, Picasso reste un ami, Marie tombera malade.

1. This is the object of verbs which can replace être, e.g. paraître, sembler, devenir, rester, demeurer, avoir l'air. The N object is distinguished from Ω_1 = N in that the verbs V_4 which occur with this object can all also occur with the object A. Also, the passive form does not exist. Ω_4 is related to $\Omega_{\hat{e}tre3}$ (A) and $\Omega_{\hat{e}tre1}$ (N).

2. Generally Ω = N is not a geographic name nor N_1 P N_2. $N_{inanimate}$ is rare, though it sometimes occurs with demeurer and devenir: L'usine devient un musée, ∃? La porte devient une table, La porte [deviendra/ est devenue] une table. With the verbs sembler and paraître, if $\Omega = N_{inanimate}$, it is followed by the verb être: Cet édifice semble être une église. However, in such cases one is more apt to find the verb ressembler à: Ce fauteuil ressemble à une chaise longue.

3. This same class of verbs occurs with the object string Vé Ωé [par/de] N (= $\Omega_{\hat{e}tre9}$): La ville semble entourée d'ennemis; and with Ω = D for a subclass of D (= $\Omega_{\hat{e}tre8}$): Jean semble mieux.

4. We can include in the V_4 subclass certain sequences V N P and V P (avoir l'air de, passer pour): Cette maison a l'air d'un palais, Paul passe pour un allemand, La vie de Paul passe pour luxueuse comparée à la tienne.

5. There is a subclass of verbs (vivre, naître, mourir, tomber, monter, partir) which could be classed as V_4 when they occur with particular subclasses of A or with N used adjectivally and without a determinant: Jean tombera malade, ≠ Il tombe un malade; La nuit descend lugubre, Il est parti soldat, il mourra général. (The latter examples could be analyzed as containing a_c instead of Ω_4.)

Ω_5 = N N/ N A : On appelle ce chien un épagneul, Cette coiffure rend les femmes jolies, Il se dit le maître.

N N/ N A is related to N $tV_{être}$ [N/A]. A more general definition of Ω_5 is $\Sigma\, \Omega_{être\,j}$, where j = 1-3, 6-9 (N, P N, A, Vé ωé, D). However, as in the case of Ω_4, the more common cases are $\Omega_{être}$ = N/A.

1. The form N A of Ω_5 is the more frequent one with verbs such as trouver, voir, juger, sentir, estimer, croire, considérer, dire: On croit Jeanne heureuse. There is more freedom to use the form N N when these verbs are reflexive: Jeanne se croit malade, Jeanne se croit une grande malade. The verbs sometimes occur with $\Omega_{\text{être } 2,8,9}$: On considère ces cavernes décorées par les Gaulois, Jean se sent trahi par ses amis, On croyait Jeanne ici, Jean se sent mal.

2. N A occurs as Ω_5 with the verbs: (se) rendre, (se) faire, laisser (taken in a particular sense) and avoir: Elle se fait belle, On laisse la chambre propre, J'ai le visage rond.

3. N N occurs as the Ω_5 of a subclass of verbs (nommer, appeler, designer) which does not have Ω = N A : On appelle ce chien un épagneul, ≠ On appelle ce chien joli.

$\Omega_{5'}$ = N P A/ N P N : Paul considère Jean comme un ami, On traite Marie de sotte.

This form has many features in common with Ω_5, but there is a preposition between the first N ($\approx \Sigma_{\text{être}}$) and A/N ($\approx \Omega_{\text{être}}$). Some of the verbs which occur with $\Omega_{5'}$ are (se) juger, (se) sentir, (se) estimer, rendre, laisser, (se) désigner, avoir, (se) traîter de/en, (se) prendre pour, (se) regarder comme, tenir pour. P = comme, pour, en, de. N_1 in N_1 P [N_2/A] can occur in the form Ω^P: Jean a Paul pour ami, Jean l'a pour ami. The position of (P) A or (P) N in Ω_5 and $\Omega_{5'}$ can change when N_1 and its adjuncts form a long group: On appelle ce meuble une table, On appelle une table un meuble ayant un plateau et quatre pieds; On considère ces mouches comme dangereuses, On considère comme dangereuses celles qui se nourrissent de charogne.

Ω_6 = que C_{1-7} (sub)*: Ils pensaient que c'était un bon jeu. Ils demandent que justice soit faite.

The presence of the indicative or subjunctive mode in Ω_6 depends upon V_6 (or the expression occupying the place of V_6).

* In the formulae, (sub) indicates the use of the subjunctive in S (Que C_1 N que C_2 à N que C_3 etc.) depending on the governing verb.

1. The indicative is used with verbs such as dire, croire, affirmer, constater, déclarer.

2. In general, the subjunctive occurs in Ω_6 with:

(a) Verbs such as désirer, souhaiter, craindre, permettre, vouloir, falloir, or phrases such as il se peut que, il est à craindre que... (indicating an order or prohibition, a wish, a fear, a regret -- except for the verb espérer, which requires the indicative).

(b) V_6 such as se réjouir, s'étonner, se plaindre, aimer, apprécier, détester, or phrases like il est étonnant que, c'est honteux que (expressing a feeling with regard to a fact).

(c) V_6 such as douter, contester, ignorer, nier, or phrases like il arrive que, il est faux que (expressing doubt or negation).

(d) A subclass of the V_6-verbs noted in 1, above, when they are in the interrogative or negative form. For example: Je déclare que vous avez raison, Je ne déclare pas que vous ayez raison.

3. The subject in the string Ω_6 is usually not the same as the subject of V_6, for V_6 = subclass (a), (b), (c): J'aime que tu sois là, ≠ J'aime que je sois là. Rather, in this case these verbs occur with Ω_9: J'aime être..., or Ω_{10}: Je crains d'être....

Ω_7 = N que C_{1-7} : Nous prévenons Paul que la route est coupée.
N_1 que $C_{1-7}^{(sub)}$: Je préviendrai Paul qu'il ne la prenne pas.

V_7 includes such verbs as prévenir, avertir, convaincre. In the second form of Ω_7, N_1 que C, the symbol N_1 indicates that N is also the subject of the verb in C. The subject in C then occurs in pronominal form, and the subjunctive is often employed. We find this form with such verbs as prier, supplier, implorer: L'enfant supplie son père qu'il cesse de le battre. These same verbs can occur with the first form of Ω_7 = N que C_6^{sub} (where N is not the same as the subject in que C), provided N belongs to a special subclass (ciel, dieu): On prie dieu qu'il pleuve. N_1 que $C^{(sub)}$ is used less often than N_1 de $V \Omega$ (= Ω_{11}): On convainc Jean de venir avec nous.

Ω_8 = [de/à] N que $C_{1-7}^{(sub)}$: Il révèlera à l'enfant que le père Noël n'existe pas, Jean demande à Paul que Marie vienne, Le Professeur obtient des élèves qu'ils se taisent.

The portion [à/de] N of Ω_8 can in certain cases (and particularly if $N \neq N_1$) * change position and occur in the position a_{C3}: A l'enfant, Jeanne révèle que le père Noël n'existe pas, Jeanne, à l'enfant, révèle que .... But if $\Sigma = Pro_p$, then à N cannot occur between Σ and tV: ≠ Elle, à l'enfant, révèle que ... .

Ω_9 = V Ω : Jean aime rêver, Marie voulait porter la valise.

1. The subject of V Ω is the same as the subject of the principal verb (V_9) but is not repeated (i.e. is zeroed).

2. When Ω in V Ω is a personal pronoun or y, en, le, it occurs before V, and in this case $\Omega_9 = \Omega^P$ V : Paul doit y penser, Marie ose le dire, Jean doit la réparer. This is applicable to all V Ω occurring as object or as part of an object.

3. Particular subclasses of verbs (such as the semi-auxiliaries devoir, vouloir, aller, venir, the "être-replacers" such as sembler, paraître, avoir l'air de, and several verbs of motion such as monter, courir) occur with Ω_9 as object but do not also occur with Ω_6 (que C) as object as do other verbs in V_9: Paul doit porter la valise, ≠ Paul doit que... .

4. A subclass of verbs (aimer, désirer, souhaiter) which occurs with both Ω_6 and Ω_9 does not allow Ω_6 to contain a subject that is different from the subject of the main verb: Jean aime porter la valise, Jean aime que Paul porte la valise, ≠ Jean aime qu'il (Jean) ... .

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* N_1 is explained in Ω_7.

Ω_{10} = [de/à] V Ω : Pierre essaie de joindre les extrémités, Marie parle de partir à Rome, Elle cherche à rencontrer Paul.

1. With this Ω we have as V_{10}:

1.1. Verbs having a constant preposition. Among them, certain verbs (such as tarder à, s'efforcer [de/à]) have no objects other than Ω_{10}, while others (such as parvenir à, se souvenir de) have several possible objects.

1.2. Verbs (such as commencer, continuer, chercher, achever, arrêter) which occur with objects Ω_{10} and Ω_1 (= N) but not Ω_2 (= [à/de] N) : Jean commence à comprendre ce texte, Jean commence une lettre, ≠ Jean commence [à/de] quelque chose.

1.3. Verbs (such as décider (de), aider (à), regarder (à), souffrir (de), veiller (à)) which occur with several possible objects and which occur with or without the preposition (à/de) depending upon the case: Je souffre (Ω = 0), Je souffre le martyre (Ω = N), Je souffre de la faim (Ω = P N), Je souffre que tu partes sans moi (Ω = que C), Je souffre d'être si gros (Ω = de V Ω).

2. Note that as in Ω_9 the subject of the infinitive verb is a zeroed repetition of the subject of V_{10}.

3. Many V_{10} verbs (cesser de, essayer de, finir de, craindre de, mériter de, aimer à, apprendre à, commencer à, continuer à) occur with a nominalized form (Ω_1 or Ω_2) of Ω_{10} : cesser de poursuivre → cesser la poursuite; apprendre à nager → apprendre la natation; s'étonner de le voir absent → s'étonner de son absence, souffrir de voir des malheureux → souffrir à la vue des malheureux.

Ω_{11} = $N_{(1)}$ [de/à] V Ω : Elle empêche les enfants de sortir, Paul force le chien à courir vite.

1. The N part of this object is generally the subject of the infinitive verb, i.e. in Ω_{11}, generally (but not always) N = N_1 (cf. Ω_7 ff.). The verb menacer is an example of V_{11} occurring with an Ω_{11} in which N ≠ N_1 : Marie menace Jean de le quitter.

2. A subclass of V_{11} (aider, obliger, forcer, encourager, inviter, inciter) occurs without N_1, which is then an "appropriate N" understood from the context. L'infirmière aide (le chirurgien) à opérer les blessés, La pluie empêche (les conducteurs) de rouler vite. In this case Ω_{11} is very close (in its form) to Ω_{10} = [de/à] V Ω.

3. Among V_{11} verbs (accuser, admirer, astreindre, comprendre, féliciter, encourager, inviter, inciter, pousser, prier, solliciter), certain ones occur with Ω = N. We assume that this is a case of Ω_{11}, in which the [de/à] V Ω is zeroed and can be supplied from the context: La mère encourage son enfant (e.g. à faire ses études). Certain others can have Ω = Que C or N_1 que C: On convainc Paul qu'il vienne avec nous, On convainc Paul de venir avec nous; On comprend que les étudiants se révoltent, On comprend les étudiants de se révolter.

4. V_{11} verbs can also occur with a nominalized form of Ω_{11}: accuser Jean d'avoir volé → accuser Jean de vol, remercier Jean d'aider → remercier Jean de son aide.

Ω_{12} = [de/à] $N_{(1)}$ [de/à] V Ω : Il exige des élèves d'être à l'heure, Il demande à Paul de partir, On apprend à l'enfant à manger seul.

1. A subclass of V_{12} (révéler à, demander à, obtenir de, exiger de) occurs with Ω_8. With these verbs N is sometimes the subject (N_1) of V Ω, and sometimes not. For this subclass, the Ω_{12} is a transform of Ω_8.

2. A subclass of V_{12} (devoir à, savoir gré à, être redevable de) does not occur with Ω_8. With these verbs generally N ≠ N_1 (i.e. the N in Ω_{12} is not the subject of V Ω).

3. As in Ω_8, the portion [à/de] N can have the position a_C : Des élèves, il exige d'être à l'heure.

4. While we have for Ω_{12} examples of: de N de V Ω, à N de V Ω, and à N à V Ω, it seems that occurrences of de N à V Ω are very rare or do not exist.

Ω_{13} = (N_1) V Ω : J'entends les oiseaux chanter, Je laisse Paul porter la valise.

1. When Ω_{13} has the form V Ω instead of N_1 V Ω (where N_1 is the subject of the infinitive verb), it is because N_2 is an implied general noun that can be zeroed: Jean regarde (les ouvriers) construire sa maison. Marie écoute (quelqu'un) fredonner une berçeuse. In this case, Ω_{13} is very close in form to Ω_9 (= V Ω), but $V_{13} \neq V_9$.

2. Ω_{13} occurs with a subclass of verbs (entendre, voir, sentir, écouter, regarder, laisser, or se V) which can occur with various different objects but not with Ω_9 (except with the implied zeroing of 1. above).

3. Ω_{13} is often transformationally related to N qui tV Ω / que N tV Ω : Je le vois venir, Je le vois qui vient, Je vois qu'il vient, for V_{13}: voir, regarder, apercevoir, entendre, écouter, sentir.

4. A frequent variant of Ω_{13} is the inverted form V N_1 (J'entends chanter les oiseaux, Je laisse dormir Pierre) in which V is generally an intransitive verb. A transitive verb might be found in the inverted form with par preceding the subject (Je regarde construire la maison par les ouvriers) but this is less comfortable than the usual form of Ω_{13}.

Ω_{14} = V Ω à N_1 : Je fais boire le lait au bébé.
V à N_1 Ω : Je fais croire à l'enfant qu'il ne travaillera pas.

1. Ω_{14} is the object of the verb faire and allows Ω to occur between the verb and the subject. If Ω is long (for example, Que C) à N_1 usually precedes Ω.

2. The verb faire is differentiated here from V_{13} even though it occurs with an object V Ω (Jean fait réparer la valise) in which par N_1 is implied (cf. Ω_{13}, 1). However, faire does not accept the form N_1 V Ω which is the basic form of Ω_{13} : # Jean fait le bourrelier réparer la valise.

The verb faire occurs with the inverted form V N_1 of Ω_{13} : Marie fait réciter l'enfant. In this case Ω is implied: Marie fait réciter (la leçon à) l'enfant.

Ω_{15} = [à/de] N V Ω : Marie paraît à Paul être la plus belle des femmes,
Jean dit de Pierre l'avoir rencontré.

1. The subject of V Ω is the same as the subject of V_{15}. V_{15} belongs to a reduced subclass of V_6 and V_8 (when Ω_8 = à N que C), and contains such verbs as dire, annoncer, déduire: Paul dit qu'il a rencontré Jean, Paul dit de Jean l'avoir rencontré; Jean annonce à Pierre qu'il a réussi son essai, Jean annonce à Pierre avoir réussi son essai. Not all V_6 or V_8 have Ω_{15} as object: # Jean croit de Paul l'avoir rencontré, # Jean lui demande Marie venir.

2. If V_{15} = paraître or sembler we have Ω_{15} (à N V Ω) closely related to the impersonal form of Ω_8 (à N que C): Marie lui semble être gentille, Il lui semble que Marie est gentille. But there are restrictions on the tense and on V: Il semble à Paul que Marie viendra avec nous, # Marie lui semble venir avec nous.

Ω_{16} = [QU_{int}/si] C : Jean ne sait pas quand l'avion partira,
Jean demande si Paul est ici.

1. QU_{int} (quand, pourquoi, où, comment, combien) appears in questions, and certain members also occur as C_s in a_C.

2. Some V_{16} and V_{17} verbs occur with Ω_6, but not all V_6 occur with $\Omega_{16,17}$. For example for V_6 = penser: # Jean pense [si/pourquoi/.../]... .

3. Ω_{16} also occurs after the imperative of a subclass of $V_{16,17}$ (dire, raconter, apprendre...): Dîtes-moi où Pierre a rangé sa valise.

4. The choice of QU_{int} seems to be linked to the form of the center string C. Restrictions are as follows:

(a) If QU_{int} = où, then C_1 = N_1 $tV_{être}$ A is not always possible: Je demande où les hommes sont bons, # Je demande où Marie est jolie.

(b) Not all QU_{int} occur before Σ_5 tV Ω or Σ_4 tV Ω : # Je sais si qu'il viendra ici étonne Paul, # Je demande quand quand Jean reviendra n'est pas important.

(c) If QU_{int} = combien, then C_1 # N_1 tV [le/une/quelques] N_2 but C_1 = N_1 tV de N_2.

(d) In $\Omega_{16} = QU_{int}\ C_2$, QU_{int} = combien seems impossible: # Je demande combien il s'évanouit.

(e) In $\Omega_{16} = QU_{int}\ C_3$, it is generally impossible to have the form $\Omega\ \Sigma\ tV$: # Je sais où ça je ne le demande pas. The forms $\Omega\ tV\ \Sigma$ and $tV\ \Sigma$ seem possible in Ω_{16} depending on the choice of QU_{int} : Je demande où passent les troupes, Je demande pourquoi à cette lettre sont joints ces papiers.

(f) $QU_{int}\ C_4$ seems generally not to occur but there are exceptions: Je sais pourquoi voilà la police.

(g) $QU_{int}\ C_5$ seems to occur when headed by si or pourquoi but not with QU_{int} = quand, combien, comment: J'ignore si c'est Paul que Jeanne préfère. # J'ignore quandc'est Paul que Jeanne préfère.

(h) QU_{int} C6 (Il y tV_{avoir} N) does not occur for QU_{int} = comment: # Je sais comment il y a quelqu'un. For other QU_{int}, it depends on the sentence which follows QU_{int}: Je sais combien il y a de gens. # Je sais combien il y a quelqu'un.

(i) $QU_{int}\ C_7$ is restricted depending on the choice of QU_{int} or on C7: Je sais quand il est nécessaire que je rentre le blé, # Je sais combien il arrive qu'il le fasse, # Je sais quand ça arrive de le faire, # Je sais comment il est nécessaire qu'il rentre le blé.

5. It seems Ω_{16} does not occur in the subjunctive: # Je demande quand Marie soit jolie. In the conditional it requires the support of a sentence adjunct: Je demande pourquoi Marie serait jolie si elle portait des lunettes.

Ω_{17} = (P) QU V Ω^{-N} Ils ignorent qui l'on soupçonne, Jean demande à quoi
(P) QU C^{-N}: tu penses, Jean ne sait que penser de la situation.

(where QU = qui, lequel (masc/fem; sing/pl), que; and
P QU = P qui, P quoi, auquel (masc/fem; sing/pl).

Ω_{17} occurs with V_{16} verbs and can also begin with an interrogative adjective (quel, quelle, quels, quelles) followed by N: Jean demande quelles preuves ils possèdent, Marie ignore en quelle année Jean est né.

Ω_{18} = A que C : Je pense indispensable que Paul parte.

Ω_{19} = A de V Ω : Jean trouve absurde de dire cela.

V_{18} and V_{19} (trouver, penser, considérer, imaginer, croire) occur with Ω_6 and several of them occur with Ω_9. A is part of the same subclass of A that occurs in the center string C_7: C'est étonnant de faire cela.

Ω_{20} = D : Jean se comporte bien, Marie habite ici.

D belongs to the same subclass of adverbs as $\Omega_{\hat{e}tre8}$ = D, namely, locative D/PN (ici, là, ailleurs, près, y, loin) and a D-subclass of the type: bien, mal, mieux, debout, de travers, ainsi, comme ci comme ça. V_{20} verbs (aller, demeurer, habiter, se tenir, se comporter, se sentir) generally do not occur without an Ω. Only en and y (representing locative D/PN) occur to the left of V_{20}: Jean y habite (e.g. ici, à Paris), Marie en sort (e.g. d'ici, de la maison, etc.).

IV. OBJECT PRONOUNS: Ω^P

Table 1 shows the order of pronouns in Ω^P and Table 2 summarizes the main facts concerning which Ω or portion of Ω is represented by Ω^P. The facts are presented for C_1, but they apply to other strings that contain V Ω (in that order); for example, in the string a_{C6} : <u>en Vant Ω</u> → <u>en Ω^P Vant</u> (<u>en construisant des maisons</u> → <u>en les construisant</u>), and in the string Ω_9 : <u>V Ω</u> → <u>Ω^P V</u> (<u>J'ose dire que tu es joli</u> → <u>J'ose le dire</u>).

1. We note the distinguished case in which an object containing V Ω is itself the Ω in $\Omega_{\hat{e}tre10}$, Ω_{avoir1}, Ω_{faire}, or Ω_{13} (for a subclass of V_{13}); in these object strings, if there is a pronominalization the pronoun Ω^P occurs preceding the verb <u>être/avoir/faire/V_{13}</u> instead of occurring directly before the infinitive V:

$\Omega_{\hat{e}tre10}$: <u>J'y suis allé</u>, # <u>Je suis y allé</u>.
Ω_{avoir1} : <u>Je l'ai portée</u>, # <u>J'ai la portée</u>.
Ω_{faire} : <u>Je la fais réparer</u>, # <u>Je fais la réparer</u>.
Ω_{13} : <u>J'entends chanter l'opéra</u>, <u>Je l'entends chanter</u>, # <u>J'entends le chanter</u>.

TABLE 1. <u>Order of pronouns in Ω^P</u> *

C1

Σ^P	Ω^P					V
Je tu il elle nous vous elles ils moi toi lui eux	me te se nous vous	le la les	lui leur	y	en	

* Table 1 does not indicate that all combinations are possible, but that if the sentence contains two (or perhaps three) pronouns, then they appear in the given

TABLE 2. Ω (or portions of Ω) represented by the pronouns Ω^P

Ω^P	can represent	of:
me te	N	Ω_1, Ω_3, Ω_5, Ω_7, Ω_{11}, $\Omega_{13}(N_1)$, Ω_{14}
nous vous	à N	Ω_2, Ω_3, Ω_8, Ω_{12}, Ω_{14}, Ω_{15}
nous vous	N P N	Ω_3
se	N	Ω_1, Ω_3, Ω_5, Ω_7, Ω_{13}, Ω_{11}
	à N	Ω_2, Ω_8, Ω_{15}
	N P N	Ω_3(pl)
la les	N	Ω_1, Ω_3(sg), $\Omega_{\text{être1}}$, Ω_4(N), Ω_7, Ω_{11}, Ω_{13}, Ω_{14}, Ω_{15}
	N P N	Ω_3(pl)
lui leur	à N	Ω_2, Ω_3, Ω_8, Ω_{12}, Ω_{15}
le	N	Ω_1, Ω_3, Ω_5, Ω_7, Ω_{11}, Ω_{13}, Ω_{14}
	A/N	$\Omega_{\text{être1,3}}$, Ω_4
	que C	Ω_6, Ω_8, Ω_{18}
	V Ω	Ω_9, Ω_{15}
	de V Ω	Ω_{12}, Ω_{19}
	QU_{int} C	Ω_{16}
	QU C	Ω_{17}
	A que C	Ω_{18}
	A de V Ω	Ω_{19}
	P N	$\Omega_{\text{être2}}$ (case 1,2,3)
en	N	Ω_1
	P N	$\Omega_{\text{être2}}$ (case 4)
	de N	Ω_2, Ω_3, Ω_4, Ω_5
	que C	Ω_6, Ω_7
	V Ω	Ω_9
	de V Ω	Ω_{10}, Ω_{11}, Ω_{12}
	de D	Ω_{20} (d'ici, de là or PN of place)
y	P N	$\Omega_{\text{être2}}$ (case 4,5)
	à N	Ω_2, Ω_3
	V Ω	Ω_9
	à V Ω	Ω_{10}, Ω_{11}
	D	Ω_{20}
There is also:		
en	de N	Ω_{32}
	que C	r_{39}
	de, à, pour } N	a_{V1}
lui... (all pronominal forms of à N)	à N	a_{V2}

A similar situation obtains in Ω_{14} when the two parts (à N and Ω) are pronominalised: Je fais boire le lait à l'enfant, Je le fais boire à l'enfant, Je lui fais boire le lait, Je le lui fais boire.

2. The possibility of pronominalizing the object often depends on the subclass of the verb or on other particular features.

2.1. The pronoun se representing N of Ω_7* occurs with a subclass of V_7 such as convaincre (Il se convainc que...) and does not occur with other verbs such as renseigner: ≠ Il se renseigne que le train part.

2.2. se - à N - Ω_{15} occurs with avouer and very few other verbs (Marie s'avoue être enceinte) and does not occur with V_{15} such as paraître: ≠ Marie se paraît être la plus belle.

2.3. le, la, les - N - Ω_4 follows the rules for pronominalizing $\Omega_{\text{être1}}$: Oui, elle la deviendra (sa femme).

2.4. le - A/N - Ω_4 occurs with such verbs as devenir, demeurer, rester: Jean le demeure (bon/mon ami). It does not occur with V_4 such as avoir l'air, sembler, and V_4 such as vivre, tomber, partir: ≠ Jean le tombera (amoureux).

2.5. le - que C - Ω_6 depends on the particular V_6; the object cannot always be pronominalized: J'aime que Paul vienne ≠ Je l'aime (where le = que Paul vienne).

2.6. le - V Ω - Ω_9 occurs with a particular subclass of V_9 (vouloir, croire): Marie le veut (e.g. partir à Nice); it does not occur with V_9 such as paraître, sembler : ≠ Marie le semble (e.g. être heureuse), ≠ Marie le paraît (e.g. vouloir un gâteau).

2.7. le - de V Ω - Ω_{19} : As was noted for Ω_6 in 2.5 above, the possibility of pronominalizing the object depends on the choice of verb.

2.8. en - N - Ω_1 : In the form C_1 where Ω = N preceded by du, de la, des, or by a plural indefinite adjective (certains, plusieurs) or by a number, Ω can be represented by Ω^P = en : Il mange [de la tarte/quelques gâteaux], Il en mange. If N was definite, Ω^P would be le, la, les : Il les mange (e.g. les tartes, ses gâteaux). Numbers and certain other adjuncts of N remain in their post-verb position in the sentence when en represents N : J'ai tué [un/deux] lapins, J'en

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* Henceforth indicated by se - N - Ω_7. This type of abbreviation will be used throughout this section.

ai tué [un/deux], J'en reçoit plusieurs (e.g. lettres), J'en choisirai de jolis (e.g. chapeaux), On en ajoute dans la soupe (e.g. des tomates).

2.9. en - de N - Ω_3 occurs with the subclass noted in 2. of V_3 (menacer): Marie en prive Paul (e.g. de dessert). en - de N - Ω_5 occurs with V_5, traiter de : Il l'en traîte (e.g. d'assassin).

2.10. en - que C - Ω_6 occurs with a subclass of V_6 (se réjouir, rêver, douter) : Il en rêve (qu'il part en Suisse).

2.11. en - V Ω - Ω_9 occurs with V_9 = avoir l'air de : Jean en a l'air (e.g. d'être malade).

2.12. en - de V Ω - Ω_{10} occurs with a subclass of V_{10} (se souvenir, souffrir, parler) : Jean en parle (e.g. d'aller en Suisse).

2.13. y - à N - Ω_2 occurs with a subclass of V_2 (penser à, applaudir à, accéder à) : Marie y pense (e.g. à Paul).

y - à N - Ω_3 occurs with a subclass of V_3 (astreindre, réduire, passer, perdre) : On l'y réduit (e.g. à la misère).

2.14. y - V Ω - Ω_9 occurs with V_9 such as monter, courir : Jean y court (e.g. ∃ ? porter la lettre).

2.15. y - à V Ω - Ω_{10} occurs with a subclass of V_{10} (s'efforcer de, parvenir à, veiller à) : Jean y parvient (e.g. à comprendre le texte).

y - à V Ω - Ω_{11} occurs with a subclass of V_{11} (perdre, passer, obliger à, aider à) : Marie y perd sa santé (e.g. à trop fumer).

3. Some details concerning the pronominalization of objects which have two parts should be noted:

3.1. Double pronominalization does not occur with pronouns of the same group in Table 1: ∄ Jean me te porte.

3.2. Double pronominalization applies in objects $\Omega_{3,5,7,8,11,12,14,15}$ and each part of the object follows the rules in Tables 1 and 2 independently. For example, in Ω_7 : Elle prévient Paul que le film est mauvais, Elle l'en prévient. But there are exceptions. For example, in Ω_3 (N P N) for a subclass of V_3 we have Jean compare Pierre à Paul, Jean le compare à lui, Jean les compare, ∄ Jean le lui compare. For Ω_5 : On la croyait heureuse, Elle se le croyait, ∄ On la le croyait. For Ω_8 : Pierre exige de Paul qu'il range ses

livres, Pierre l'exige de lui, ≠ Pierre le lui exige. With Ω_{13} there are several special restrictions illustrated by the following examples: Jean envoie Pierre faire le marché, Jean l'envoie le faire, Jean l'y envoie. Note that only a subclass of V_{13} occurs with Ω^P = y : Je regarde Pierre réparer la voiture, Je le regarde la réparer, ≠ Je le la regarde réparer.

4. There are some cases of pronominalization which are not Ω^P :

4.1. Possessive pronouns (le mien, le tien, le sien, etc.), demonstrative pronouns (celui-ci, ceci, etc., but not ce (c'), ceux) and indefinite pronouns (personne, quelqu'un, plusieurs, tout, etc., but not on, nul, tel(s), telle(s)). All of these, when they are objects, do not change their position in the sentence Σ tV Ω : Jean réclame le sien.

4.2. In the case of P N, if the preposition remains in the sentence when N is pronominalized, then the pronoun does not change position: Jean parle [de/ avec] lui, Pierre s'adresse à elle.

5. Several additional comments about pronominalization in center strings other than C_1 :

5.1. In a question Σ tV Ω ? where Σ = N is definite or named, if the object is a pronoun then the subject is repeated as a pronoun: Le garçon porte la valise? Le garçon la porte-t-il?

5.2. In string C_9 (imperative) if the form is negative the object pronoun occurs in the position Ω^P : Ne la consolez pas! Ne m'y faites pas penser! If the form is positive the object pronoun does not change position: Consolez-la! Faites-m'y penser!

6. Agreement of the past participle with Ω^P. In C_1 (Σ tV Ω) if tV is a form of avoir followed by a verb in the form Vé (past participle) then Vé is invariable (i.e. is not subject to agreement restrictions) unless the object of Vé is N in the pronominalized form Ω^P : Nous avions cueilli des cerises, Nous les avions cueillies. Similarly, the past participle occurring in the right adjunct of N, r_{N6}, agrees with the noun it adjoins: Marie porte la robe que sa mère a faite. However, there are special cases:

6.1. With the pronoun en, usually there is no agreement: On a mis des tomates dans la sauce, On en a mis dans la sauce. This should not be confused

with the case where en represents de N_2 occurring as an adjunct of N_1; in this case if the participle occurs in r_{N6} then there is agreement with the pronominalized N_1 in r_{N6} : On a reçu des lettres de Paris, Voici les lettres qu'on en a reçues. If an adverb of quantity (autant, beaucoup, combien, moins) precedes en, there is usually agreement: Combien en avez-vous cueillies? (e.g. de cerises). However, there is no agreement if the adverb follows en: J'en ai cueilli beaucoup, Il en a tant écrit, de lettres!

6.2. With the neuter pronoun le, the past participle is always invariable: Jean prétend que Marie avait reconnu qu'elle avait tort, Jean prétend que Marie l'avait reconnu.

6.3. Verbs which do not occur with $\Omega_1 = N$ (e.g. intransitive verbs, verbs which take only an indirect object (e.g. plaire), impersonal verbs which occur in C_6) remain invariable in the past participle: Cette histoire m'a plu, Les orages qu'il a fait ont gâché les récoltes. The verbs courir, coûter, régner, valoir, vivre are invariable when used literally, but agree when used figuratively: Les soixante-quinze années qu'il a vécu..., les belles années qu'il a vécues....

6.4. When N_1 of $\Omega = N_1\ A/N_1\ N$ is pronominalized, the past participle agrees with the pronominalized N_1: Cette nouvelle l'a rendue très triste (e.g. Marie). Similarly with Ω_3 (= N P N) : On l'a comparée à Suzanne (e.g. Marie).

6.5. In the case of Ω = N V Ω, Vé agrees with Ω^P when N → Ω^P if N is Σ of V Ω: Je l'ai entendue raconter une histoire (e.g. Marie). However, if the pronoun does not represent Σ, but Ω, then Vé is invariable: Je l'ai entendu raconter par Marie (e.g. l'histoire). Vé is invariable if lui or leur precedes it: Je la lui ai entendu raconter.

6.6. The past participle fait, when followed by V, is invariable: Ils ont fait pleurer les enfants, Ils les ont fait pleurer.

6.7. When V Ω can be understood (i.e. zeroed) the past participle is invariable: Je lui ai dit toutes les bêtises que j'ai voulu (lui dire).

6.8. In the case of r_{N6} if N represents the subject of V Ω, Vé agrees: Les oiseaux que j'ai vus naître. If N represents the object of V, Vé is invariable: Les cerises que j'ai vu cueillir.

V. OBJECTS OF THE VERB ÊTRE: $\Omega_{\hat{e}tre}$

$\Omega_{\hat{e}tre1}$ = N Le chef est un brigand.

We have the same words (denoted by N) as for Σ_1 and Ω_1 (proper nouns, names of cities without articles, nouns having a determinant, compound nouns, etc.).

1. Generally N is preceded by an article* (Je suis une femme), but the article may not be present in the case of nouns denoting profession or occupation: Jean est boulanger, Elle est mère. Such nouns can, of course, be used with a determinant when they are followed by an adjunct or otherwise made definite: Jean est [le/notre/un/ce] directeur qui.... The article may not be present also in the case where N is an adjectival expression characterizing the subject: Anna est esprit fort. (See also 5 below.)

2. Generally an N occurring as $\Omega_{\hat{e}tre}$ agrees with the N (noun or pronoun) occurring as $\Sigma_{\hat{e}tre}$: Il est le candidat, Ces femmes sont des ouvrières. But there are some cases where the subject and object are of different genders. For example:

2.1. If the subject is feminine and the object is an N denoting a profession or occupation where N has no feminine equivalent: Cette femme est un historien [un juge, un censeur], Jeanne est un ange [un témoin, un tyran, un voyou].

2.2. If one of the two N's is a classificatory word: La baleine est un mammifère, Cet os est une omoplate, La jalousie est un défaut. There are other cases where Σ and Ω do not agree in number: Ces fleurs sont [une merveille/une splendeur/un enchantement].

3. Pronominalization of N occurring as $\Omega_{\hat{e}tre}$.

3.1. If $\Omega_{\hat{e}tre1}$ = Pro_p, then Pro_p ≠ je, tu, il(s), me, te, se, leur. If $\Omega_{\hat{e}tre1}$ = Pro_p, and Pro_p = moi, toi, soi, lui, elle(s), nous, vous, eux, then Σ is usually ce (c') (C'est lui), or else the Pro_p is completed by -même : Jean est lui-même. If $\Omega_{\hat{e}tre1}$ = Pro_{ind}, and Pro_{ind} = personne, rien, un autre, then the same rules apply as in the corresponding case of Ω_1 : Je ne suis rien;

* "Article" and "determinant" are used interchangeably in this paper.

vous en êtes un autre. Also, $Pro_{ind} \neq$ nul, aucun, on, certains, chacun, tel.

3.2. Only the pronouns le, la, les, en, y occur in the position Ω^P, as follows:

(a) Ω^P = le (neuter) when it represents an N without an article or one that is preceded by an indefinite article, or an A, or a Vé : Nous le sommes (e.g. des frères/gentilles/lavés/aussi forts que vous).

(b) Ω^P = le, la, les when these pronouns represent an N that is determined by a definite article, a possessive adjective, or a demonstrative adjective: Es-tu [sa femme/la victime/cette mère]? Oui, je la suis.

(c) With Σ_1 = on, $\Omega_{être}$ = N (or A) agrees (masc/fem, sing/pl) with the noun that on stands for: On était des frères, On était petites.

4. When $\Sigma = \Sigma_4$ ([QU_{int}/si]C), or Σ_5 (V Ω), or Σ_6 (que C), then $\Omega_{être}$ = N belongs to the subclass N_s of N : Qu'il vienne ici est une absurdité.

5. When $\Omega_{êtrel}$ = N has no adjuncts, only certain determinants can occur (unless the sentence is part of a dialogue and contains zeroed material): Le garçon est le laitier, Le garçon est un aveugle, La table est un meuble, ∄ Le garçon est [l'ami/l'élève/le fils], ∄ Le garçon est [cet aveugle/ce joueur]. Thus for example, if C_1 has the form $C_1 = T_1\ N_1\ tV_{être}\ T_2\ N_2$ (where T stands for determinant), then*

if T_1 = le, la, les,	$T_2 \neq$ le, la, les (exception: N_2 occupation)
	$T_2 \neq$ ce, cet, cette, ces.
if T_1 = un, une, des,	$T_2 \neq$ un, une, des (exception: N_2 classifier noun of N_1 (Une table est un meuble))
	$T_2 \neq$ ce, cet, cette, ces (∄ Un enfant est [un/ce] garçon)
if T_1 = plusieurs, certains,	$T_2 \neq$ le, la, les (exception: N_2 occupation)
	$T_2 \neq$ un, deux, trois... (∄ Plusieurs enfants sont [les/deux] amis)
if T_1 = ce, cet, cette, ces,	$T_2 \neq$ ce, cet, cette, ces (∄ Cet enfant est ce garçon)
if T_1 = ma, ta, sa,	$T_2 \neq$ le, la, les (exception: N_2 occupation) (∄ Ta maison est le château)

* These rules hold except in the presence of certain adjuncts of C_1.

if T_1 = un, deux, ..., $T_2 \neq$ le, la, les (exception: N_2 occupation)
$T_2 \neq$ ce, cet, cette, ces ($\not\approx$ Trois enfants sont [les/ces] amis)

if T_1 = 0 $T_2 \neq$ le, la, les (exception: N_2 occupation or geographic: New York est la capitale)

Note that if N_2 is a compound noun, the relations between T_1 and T_2 are the same as noted above: La vedette est la femme-poisson, $\not\approx$ Pierre est le nouveau-né. If N_2 = N P N there seem to be no such restrictions: Le danger est l'approche des côtes.

$\Omega_{\hat{e}tre2}$ = P N Pierre est en Suède.

We present here some examples of $\Omega_{\hat{e}tre2}$ in the form P N and in the corresponding form Ω^{P} along with some details concerning the values of $\Sigma_{\hat{e}tre}$ which occur with different types of $\Omega_{\hat{e}tre2}$. The strings $\Sigma_{4,5,6}$ do not occur at all with $\Omega_{\hat{e}tre2}$.

1. Je suis [en voyage/en pleurs/en sueur], Je le suis $\approx$ Je voyage, je pleure, je sue. Here, Σ = N animate or a subclass of N (avion, voiture) occurring with particular subclasses of P and N (en descente, en vol, en fuite). $\Sigma \neq$ geographic name or N P N or an inanimate N.

2. Jean est [en larmes/en colère/en joie], Jean l'est $\approx$ Jean [a/éprouve/montre/exprime][des larmes/de la colère/de la joie]. Here Σ = N animate or a subclass of N (ville, volcan) which depends on the choice of object P N. $\Sigma \neq$ N P N or an inanimate N.

3. Marie est [en deuil/en noir/en pantalon], Marie l'est $\approx$ Marie porte [le deuil/...]. Here Σ = N animate or, according to the P N, a subclass of N (ville, usine). $\Sigma \neq$ N P N or an inanimate noun.

4. Je suis à Paris [sur une échelle/en Suisse/chez Paul], J'y suis, Je suis chez lui. Here, $\Sigma \neq$ N P N. Further examples of pronominal forms are: Je suis de Rome ($\approx$ Je suis romain), Je suis de là. Je suis loin de Rome, J'en suis loin. Je suis loin de Paul, Je suis loin de lui. Le chapeau est à Pierre,

Le chapeau est à lui. Je suis avec Paul, Je suis avec lui.

5. Nous sommes [en avril/en hiver/en 1967], Nous y sommes.

$\Omega_{\hat{\text{être}}3}$ = A : La terre est ronde.

1. A alone.

1.1. Virtually all adjectives (A) can be objects of the verb être. They agree (masc/fem; sing/pl) with the subject N except for A of color, which remain invariable when they are obtained from a noun (cerise, marron, citron, abricot): Les portes sont marron; or when the A of color itself has an r_A : Sa robe est bleu ciel, Les murs sont vert pâle.

1.2. Possessive adjectives are not $\Omega_{\hat{\text{être}}}$ but there is an archaic literary usage which could yield this case. For example: L'idée est mienne.

1.3. Certain indefinite adjectives are also qualitative, in which case they occur as $\Omega_{\hat{\text{être}}}$ (plusieurs, divers, quelconque, certain): Cette robe est quelconque.

1.4. Numbers (as adjectives) are also $\Omega_{\hat{\text{être}}}$: Ils étaient trois, Jean est second, Ce tissu est double. An exception is un, une: ≠ Il est un. They are invariable except for those of the type centenaire, quadragenaire, which take the plural marker, as do vingt and cent when they are part of a compound number and occur at the end of a sentence: Ils sont quatre vingts.

1.5. Verbal adjectives created from participles agree with N: Les rues sont passantes, Elle est mariée, Ils sont nés. Certain of them are distinguishable from the present participle (Vant) by their spelling: Vant: fatiguant, adhérant; A: fatigant, adhérent.

1.6. In Ω_4 = A/N we find the same adjectives as in A = $\Omega_{\hat{\text{être}}}$. The V_4-verbs (paraître, sembler, devenir) which occur with Ω_4 could instead have been included here. But all $\Omega_{\hat{\text{être}}}$ are not Ω of these verbs. For example, this is the case with P N ($\Omega_{\hat{\text{être}}2}$) such as en avril, à Paris, avec Paul: ≠ Nous paraissons en avril.

1.7. If $\Sigma_{\hat{\text{être}}} \neq$ N and $\Sigma_{\hat{\text{être}}} = \Sigma_{3,4,5,6}$, then certain A cannot be $\Omega_{\hat{\text{être}}}$: Vivre est [naturel/agréable/difficile], ≠ Vivre est [rouge/maigre/rond].

1.8. As with N = compound noun, we have A = compound adjective. The most common forms are:

A-A: aigre-doux, ivre-mort, sourd-muet.

Ao-A: aéro-dynamique, franco-belge, electro-ménager.

bi-A: bi-atomique.

[D/P]-A: avant-dernier, intra-veineux, extra-fin, post-scolaire.

A_D-A: grand-ducal, franc-maçonnique, mort-né (where A_D has the function of an adverb).

Only A-A compound adjectives agree (masc/fem; sing/pl) in both parts with N. For the other types, only the right constituent (-A) agrees with N.

1.9. Occasionally $\Omega_{\hat{e}tre}$ = A (or N) is emphasized by occurring at the beginning of the sentence: Précieuses sont ces choses. This is noted in center string C_3.

2. A P N / A P V Ω / A P V Ω^{-N}

Occasionally it seems difficult to analyze P N or P V Ω or P V Ω^{-N} as right adjuncts of A ($r_{A1,4}$). For example, Jean est mort is quite different from Jean est mort de fatigue (used figuratively). Similarly, Il est bon differs from Il est bon pour l'armée, and Ces chaussures sont bonnes differs from Ces chaussures sont bonnes à jeter. A major type of sentence having this form is N $tV_{\hat{e}tre}$ A_S [P V Ω / P V Ω^{-N}] : Cet homme est certain de triompher, Ce livre est difficile à lire. Here A_S represents a subset of A_S adjectives including facile, difficile utile (but not vrai, sûr), and P = à/de. In the form N $tV_{\hat{e}tre}$ A_S P V Ω, the subject N is the same as the missing subject of V (l'homme triomphe); in the form N $tV_{\hat{e}tre}$ P V Ω^{-N}, the subject N is the same as the missing object of V (lire ce livre). These forms will be encountered again in r_{N3}, 5., and in $r_{A1,4}$.

3. A P V Ω

Another case in which the adjunct status of P V Ω (P = à) following A is questionable concerns a subclass of aspectual adjectives (prêt, enclin, apte, adroit, habile): Jean est apte à traduire ce livre.

$\Omega_{\hat{e}tre4}$ = V Ω Vivre est ne pas souffrir.

The infinitive as $\Omega_{\hat{e}tre}$ requires that $\Sigma_{\hat{e}tre}$ be either V Ω or cela/ce. If Σ is ce, it usually occurs in conjunction with a V Ω : Fumer c'est racourcir la vie (cf. VIII, a_{N5}). This object rarely occurs in an affirmative sentence, and in V Ω generally $\Omega = \emptyset$. Σ and Ω usually have the same form (simple or composite, active or passive): Vivre est aimer, Avoir aimé est avoir vécu.

$\Omega_{\hat{e}tre5}$ = à V Ω Le pire est à craindre, Cet homme est à tuer.

All Σ seem possible with this object, depending upon the given à V Ω.

$\Omega_{\hat{e}tre6}$ = de V Ω Le pire est de souffrir.

N (Σ) belongs to subclasses:

N from A/D : le meilleur, le moins urgent, le bien.
N from V_{10} : la souffrance, l'espoir, l'aide.
N from V_{11} : l'encouragement, la menace, l'accusation.
N from V_6 : le désir, la pensée, le regret, la preuve.
and N such as: la joie, le besoin, la soif, le courage.

$\Omega_{\hat{e}tre7}$ = que C_{1-7} Mon avis est que Paul est gentil.

When Σ = N it is generally a member of the subclass N_S, or of those subclasses specified as the subject for $\Omega_{\hat{e}tre6}$. With N_S there are no restrictions on the determinant; with the other subclasses one has le when N comes from A/D and otherwise a T of the type mon: Le pire est que tu sois malade, Notre espoir est qu'il ne soit pas réélu. For a certain subclass of N = Σ (including for example la volonté, le souhait, la concession, le doute, la crainte, la surprise) $\Omega_{\hat{e}tre}$ is in the subjunctive.

$\Omega_{\hat{e}tre8}$ = D : Jean est ici.

1. D alone

Several subclasses of adverbs and adverbial expressions can occurs as $\Omega_{\hat{e}tre}$.

D place: ici, là, ailleurs, loin, dedans, and où (in C8),
but not: arrière, avant, contre (≠ Il est avant).

D manner, state: bien, mal, comme-ci comme-ça, mieux, à sec de biais, and comment (in C8).

D quantity: peu, beaucoup, trop, and combien (in C8),
but not: bien (des), pas mal (de), plus (de), environ
(Ils sont beaucoup, ≠ Ils sont environ).
D_q can be $\Omega_{\hat{e}tre}$ under the same conditions as when it occurs as Σ_1, Ω_1. $\Sigma_{\hat{e}tre}$ = N is plural with this object: ≠ Il est beaucoup.

D time: C'était quand ?, C'était [hier/naguère/jadis], Ce sera [demain/plus tard/bientôt], Ce ne sera jamais, Ce [sera/est/était][aujourd'hui/maintenant/à l'instant/tout à l'heure], [C'/il] est [tard/tôt].

P D : Il est en arrière, L'or est en trop, Jean est de trop.

2. D V Ω

Often the excision of V Ω after D changes the sense of D, or can hardly be made at all: Jean est [près/loin/à mille lieues] de t'aimer.

$\Omega_{\hat{e}tre9}$ = Vé Ωé [par/de] N : L'enfant est lavé par sa mère, Jean est élu président par l'assemblée.

1. If [par/de] N is not present, it is said to have been zeroed according to one of the following cases:

1.1. The subject is given by the context.

1.2. The subject is a general pronoun: on, quelqu'un.

1.3. The subject belongs to a subclass of words linked to the verb, for example: La ville est inondée (par l'eau). (This is possible only if the verb is not used metaphorically.)

2. The question arises as to whether the portion [par/de] N could alternatively have been analyzed as an adjunct. This is possible, but if there is a restriction between the subject N and the verb V in the active form, this becomes

a restriction between the N of [par/de] N and the verb Vé in the passive form. The portion [par/de] N occasionally permutes with the other elements of $\Omega_{\text{être9}}$; if it were treated as an adjunct it would be in the a_C position. For example: Par les vagues les eaux sont agitées, La ville, d'ennemis, est encerclée, Jane, de tous, est aimée.

In some cases it is impossible to excise [de/par N] from a sequence N est Vé [de/par] N. Often this corresponds to a metaphorical use of the verb or to other cases in which [de/par N] does not represent either the agent or an adjunct of C_1 : Il serait lavé de l'accusation, Ils sont coupés des masses. In some cases excising the portion [par/de] N changes the meaning of the remainder of the sentence: Ils sont débauchés par l'usine, Ces femmes sont entretenues par l'Etat, La Russie est envahie de mouches, La ville est inondée de produits américains.

3. In the pronominal form $\Sigma\ \Omega^P$ tV, generally Ω^P = le (representing Vé P N) or en (representing de N): La sicile est dévastée (par les tremblements de terre), La Sicile l'est; Jeanne en est aimée (e.g. de lui/des hommes).

4. A comparison of the active and passive forms is presented in Tables 3 and 4.

If the subject in the active form is:		Then the form of the subject in the passive is:
Σ_1	N	[par/de] N
	N = Pro: je,tu,il...	[par/de] moi, toi, lui...
	Pro: on	[par/de] nous, quelqu'un, moi
	Pro: nul	de personne
Σ_2	Qui C	[par/de] Qui C
Σ_3	Ce QU tV	[par/de] Ce QU tV
Σ_6	Que C	Que C
	Qu'il vienne m'étonne.	Je suis étonnée (par le fait) qu'il vienne.

TABLE 3
Form of Subject in the Passive

TABLE 4
Passive Form of Object

Active form	Passive form	
Ω	Σ	Ωé
$\Omega_1 = N_1$	N_1 Jeanne est aimée (par N)	∅
$\Omega_3 = N_2 P\ N_3$	N_2 Paul est comparé (par N)	P N_3 à Jacques.
$\Omega_5 = N_2[N_3/A]$	N_2 Le chien est appelé	$[N_3/A]$ Médor. But not all V_5: ≠ Il est cru un génie.
$\Omega_{5'} = N_2[PN_3/A]$	N_2 Jean est considéré	[P N_3/ P A] comme un ami.
Ω_6 = que C	Que C Que justice soit faite est souvent réclamée (par N) mais jamais obtenue.	∅
Ω_7 = [à/de] N que C	Que C Que le père Noël n'existe pas est révélé	[à/de] N à l'enfant.
Ω_{11} = N de V	N Les enfants sont empêchés	de V de sortir.
Ω_{16} = [QU/si] C	[QU/si] C Si Paul est malade est complètement ignoré... (Subclass of V_{16})	∅
Ω_{17} = A de V Ω	de V Ω De dire cela est trouvé (Subclass of V_{17})	A absurde.

$\Omega_{\hat{e}tre10} = \Omega_{avoir1}{}^{*}$ = Vé Ω : Je suis allé à Cannes, J'ai porté la valise.

This object is specially defined for the verbs être and avoir in order to handle the compound tenses. To say that a verb is conjugated with être or avoir is to say that this verb can occur in the Vé position of string $\Omega_{\hat{e}tre10}$ / Ω_{avoir1}. Lists of verbs conjugated with être or avoir are readily available in standard French grammars. The two verbs être and avoir are conjugated with avoir. In this case (when être/avoir = Vé in Ω_{avoir1}) $\Omega_{\hat{e}tre10}$ / Ω_{avoir1} never occurs as object of Vé : ∄ J'ai été allé à Cannes, ∄ J'ai eu porté la valise.

TABLE 5 The verb avoir

Σ_{avoir}	Ω_{avoir}	Ω_{pro} / Ω^{P}	C_i with V_{avoir}
Σ_1 no restrictions	Ω_1 = N Jean a un ami.	Je l'ai, but not: lui, leur, se, y, le (neuter)	C_1 but not the form Σ tV: ∄ Jean a.
Σ_{2-6} require a special Ω_{avoir} "Qu'il vienne a de l'importance"	Ω_2: J'ai de la chance/du chagrin/ ... but not Ω_2 = [à, de, sûr, à propos] N ∄ J'ai avec Paul. Ω_3: J'ai Jean comme ami. Ω_6 (rarely): J'ai que je suis malade. Ω_{10}: J'ai à travailler. J'ai le linge à laver. Ω_{11}: N[de/à] V Ω : J'ai le temps de lire. The objects: $\Omega_{4,7,8,9,12,13,14,15,16,17,18,19}$ do not occur as Ω_{avoir}.		C_3: Ω tV_{avoir} Σ : La peste avait ce rat, for an effect of style. But not the other forms of C_3. C_6: only Il y a N C_2, C_4, C_7 do not occur with the verb avoir.

* The object strings which occur with avoir are listed in Table 5.

VI. RIGHT ADJUNCTS OF N: r_N

$r_{N1} = N$: les carpes femelles, mon ami le docteur.

1. One type of r_{N1} is a common noun used as an adjective without a determinant: Les carpes femelles pondent des oeufs, On causait de l'aspect église de ce Temple. In the second example N_2 (église) qualifies N_1 (aspect) and gives an idea of comparison as in: Une ville champignon, la ville lumière, un air vache. In this case N_2 does not agree with N_1 (pl.): les villes champignon. However, in other cases there is agreement: carpes femelles.

In the case of N_1N_2 or of N_1A where N_1 is a general word that covers the whole class habitually associated with N_2 or with A, N_1 can be $\emptyset$ (and A is utilized as a noun): un(e) (personne) aveugle, un(e) (animal) femelle, un(e) (oeuvre) classique, les (personnes) maigres.

2. Another type of $r_{N1} = N$ is apposition, occurring with or without determinants and with or without commas; the different forms carry different nuances: Je dois téléphoner à mon ami docteur, Mon ami le violoniste viendra ce soir, Monsieur Durand, le charpentier du coin, vient de s'acheter une voiture.

$r_{N2} = P\ N$: La femme de Jean est partie en Suisse, Le marie de celle-ci reviendra bientôt.

(where P : de, à, en, entre, sur, avec, dans, etc.)

1. If N = Pro, then Pro = Pro_{ind} (la robe de quelqu'un) but not on, tel, nul, tout ($\not=$ La robe de on), or Pro = $Pro_{dém}$ (le mari de celle-ci) but not ce, celui, celle(s), ceux ($\not=$ la robe de celle), or Pro = Pro_{poss} (la part des miens), or Pro = Pro_p (Une lettre de vous) but not je, tu, il(s), me, te, se, la, les, leur ($\not=$ Une lettre de il).

2. P N is often the adjunct of a nominalized verb (Vn). For example, Vn de N (where N = Σ) : Le refus de Paul; Vn de N (where N = Ω) : Le travail du bois; Vn en N (where N is locative) : Une promenade en forêt. When the verb has a prepositional object it usually occurs with the same preposition when the

object occurs as right adjunct of Vn:

Arriver à la gare	L'arrivée à la gare
Partir pour Lyon	Le départ pour Lyon
Ordonner aux enfants	L'ordre aux enfants
Rompre avec les amis	La rupture avec les amis
Choisir entre deux amis	Le choix entre deux amis

3. In general N with r_N = P N is in conformity with a sentence N_1 est P N (La robe est en laine, la robe en laine) or with a sentence N_1 tV_{ap} N_2* (Paul a une maison, la maison de Paul), or with a sentence-part N_1 (qui) tV N_2 : La jeune fille porte une robe rose ..., La jeune fille à la robe rose... ; Cette machine fonctionne à la vapeur, Cette machine à vapeur... .

4. N_2 in N_1 P N_2 can in certain cases occur without a determinant: le poisson de mer, les voyages par avion. The effect is that N_1 P N_2 functions like a classifier noun, though a similar effect is found with some adjectival P N's in which N has a determinant: Le homard à l'américaine.

5. Often r_{N2} is very close to r_{N3} (= A) :

Une professeur en retraite	Un professeur retraîté
Un vol de nuit	Un vol nocturne
Une femme sans dents	Une femme édentée
Un médicament contre le cancer	Un médicament anticancéreux

6. The examples of P N which occur as $\Omega_{\hat{e}tre2}$ can be used as examples of r_{N2} with the exception of en avril, en août, en 1924, and similar P N's.

7. Several prepositions impose restrictions on the N of P N; e.g. after entre, we have a plural N or N et N : La place entre Paul et Pierre est déja occupée. (cf. III, Ω_2, 3.)

8. In some cases, P N can occur in the form of a pronoun en (in the position Ω^P, cf. IV, table 2). For example: La traduction de ce livre est mauvaise, La traduction en est mauvaise; Tu me donne des nouvelles de Pierre, Tu m'en donne des nouvelles; Tu cueilles tous les fruits du cerisier, Tu en

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* V_{ap} = appropriate verb, i.e. the verb which a speaker of the language would supply when transforming N_1 P N_2 into N_1 tV N_2.

cueilles tous les fruits. Note that there are some restrictions on this form: L'architecture de cette maison est sommaire, L'architecture en est sommaire; Les maisons des étudiants sont jolies, ∄ Les maisons en sont jolies.

9. There are also cases of r_{N2} = P N which involve measure sequences, numbers, references, dates, etc. : le journal du 10 août, la guerre de 14-18, un enfant de 10 ans.

r_{N3} = A : J'ai acheté une table ronde.

A = adjective, compound adjective, or adjective derived from N (= Na). A agrees with N (masc/fem, sing/pl) except as noted in $\Omega_{\hat{e}tre}$ = A. When several A follow N they are separated by commas: une soupe épaisse, bonne, onctueuse.

1. Many A can occur either to the right or left of N (une fille gentille, une gentille fille). Certain adjectives vary in meaning depending upon their positic.. They belong to a subclass of A with members such as propre, seul, simple. Il a tué sa femme de ses propres mains, Il porte une chemise propre (cf. VII, ℓ_{N1}, 1). A occurs more often as r_N than as ℓ_N.

Those adjectives which occur as A = r_N can usually also occur as A = $\Omega_{\hat{e}tre}$ (La table est ronde). When A is such as cannot occur as $\Omega_{\hat{e}tre}$ it is always r_N (not ℓ_N) and we denote this as A_r. There are several possibilities for A_r. It can be an adjective derived from N : une boucherie chevaline, ∄ La boucherie est chevaline, ∄ une chevaline boucherie. It can also be a numerical adjective of different types (un homme quadragénaire, un tissu double), and occasionally a cardinal number used in place of an ordinal (La place quatre est louée). We detail below several of the cases in which A is almost always r_N, but can also be $\Omega_{\hat{e}tre}$:

1.1. A is a long adjective: Une femme élégante, Un enfant intelligent.

1.2. For euphony: du linge sec, un lit court.

1.3. A of color: une porte verte, un ciel gris.

1.4. A itself has an r_A : un homme content de son sort.

1.5. A is composed of a verb and one of the suffixes -able/ -ible : les tissus lavables, des fractions convertibles.

1.6. Na is derived from a proper noun, or from a geographic name or term: la pensée marxiste, les plaines canadiennes, le camembert normand, un paysage désertique, des maisons villageoises.

1.7. Na brings the idea of comparison: un tissu zébré, une banane tigrée.

1.8. Na is derived from a noun denoting a physical form or feature: un visage ovale, une personne chevelue, une pomme ridée.

1.9. Na is a term of measure: une parution annuelle, la distance kilométrique.

1.10. Na is a grammatical term: une forme interrogative, l'article défini.

2. In the case of A_r, we note that:

2.1. N having A_r as an adjunct is often a nominalized verb: Le président voyage → le voyage présidentiel, Les grévistes agissent → l'action gréviste.

2.2. N_1 N_2a in certain cases is close to N_2 $tV_{\hat{e}tre}$ N_1 : La sexualité est une fonction, la fonction sexuelle; La droite est un côté, le coté droit.

2.3. N_1 N_2a in certain cases is close to N_1 $tV_{\hat{e}tre}$ P N_2 : La question est à propos du sucre, la question sucrière.

3. Verbal adjectives created from participles agree with N. They are almost always r_N and also $\Omega_{\hat{e}tre}$: un chien errant, des personnes négligentes, une femme mariée, les feuilles tombées.

4. Several adverbs are used as adjectives. They are always r_N and belong to a subclass of adverbs of manner, of state (bien, mal, comme ci comme ça, à sec). This subclass is smaller than that noted in $\Omega_{\hat{e}tre8}$.

5. A P N : Une lettre pleine de promesses.
   A P V Ω : Un homme certain de triompher.
   A P V Ω^{-N} : Un objet difficile à saisir.

These cases correspond to those noted in $\Omega_{\hat{e}tre3,2}$. The superscript -N indicates that the object of the verb lacks an N, as seen by comparing the given form with paraphrases: On saisit difficilement cet objet, un objet que l'on saisit difficilement.

r_{N4} = Vé Ω é [par/de] N : Le professeur rendit les devoirs lus, corrigés et notés; Les dégâts constatés par l'huissier sont considérables; Les ouvrières débauchées par l'usine s'inscrivent au chômage.

r_{N4} agrees with N. This form is also $\Omega_{\hat{e}tre9}$.

r_{N5} = de [A/D] : Il y a dix places de disponibles, Pierre a du temps de libre, Un ami de toujours est allé à sa rencontre.

When the host N occurs in the form of the pronoun en, r_{N5} remains in its original place: Il y en a de jolis. De A does not occur as $\Omega_{\hat{e}tre}$. The D which occur as r_{N5} belong to a subclass of the adverbs of place or to a subclass of the adverbs of place: ici, là, loin, hier, maintenant.

r_{N6} = QU $C^{-N/PN/\emptyset}$: L'homme qui entre au cinéma est un ami de Paul, Jean quitte le pays où il est né.

(where C is as noted in 3 below)

1. The superscript -N/PN marks the case where Σ/Ω does not appear in C but is present in pronominal form as part of the QU-word, and -∅ marks the case where an adjunct does not appear in the center string, but, similarly, in pronominal form.

2. QU occurs in its simple forms (e.g. qui, que) and in its composite forms (e.g. lequel, duquel) and, depending on the verb, as P QU (e.g. à que, de qui, à propos de qui): L'eau dans laquelle le poisson nage doit être claire, Jean parle du pays d'où il vient.

3. The choice of center string C.

3.1. C_1 can occur in the form where the verb precedes the subject: l'eau dans laquelle nage le poisson.

3.2. The [voici/voilà] N form of C_4 can occur here as N que voici, in which que voici has the role of r_N : Le livre que voici a été écrit par Paul.

3.3. QU $C6^{-N}$: Le livre qu'il y a sur la table t'appartient, Le froid qu'il fait nous empêche de sortir, Le livre dont il s'agit est un livre d'aventures, Le moment où Paul est venu était mal choisi. When C_6 = Il y tV_{avoir} N, QU = Que (qu'). When C_6 = Il tV_{il} Ω, QU = que, dont, de qui, etc. Forms of C_6 such as il pleut or il tombe de la pluie do not occur as r_{N6} = Que C_6^{-N}, but a form such as il tombe de la pluie can occur as r_{N6} = Qui C_6^{-N} : La pluie qui tombe.

3.4. QU C_7^{-N} can be r_N if Σ_S of C_7 is il. Here the pronominalized part is Ω = N of Ω_S = Que C/de V Ω : Les fruits qu'il était urgent de cueillir sont gâtés.

3.5. There is a special subtype of r_{N6} which is preceded by a comma. In transformational analysis the comma + wh is analyzed as a conjunction so that QU C^{-N} → et C, where the pronominalized N in QU C^{-N} is restored to its N form in et C.

r_{N7} = Vant Ω — Les jeunes se moquent des personnes exigeant le respect, Nous avons vu un chien errant dans les rues.

r_{N8} = à V Ω^{-N} — Marie plie le linge à repasser.

r_{N8} closely resembles r_{N6} = QU C^{-N} (Elle plie le linge qu'elle repassera/ Elle plie le linge qu'on doit repasser.) The string à V Ω also occurs as $\Omega_{\hat{e}tre}$.

r_{N9} = que C_{1-7} : Le fait qu'il porte la valise prouve sa bonne volonté.

The N which is adjoined by r_{N9} belongs to the subclass N_s or is part of the class V_sn derived by nominalizing verbs which occur with Σ_6 or Ω_6 : le désir, le regret, l'étonnement, la preuve, la menace. The subjunctive is necessary under the same conditions as indicated for Ω_6 and $\Omega_{\hat{e}tre7}$: La crainte que Paul veuille divorcer paralyse Marie. If $N/V_Sn = \Omega$, $r_N \neq$ que C (≠ Je fais un voeux que la guerre finisse).

r_{N10} = [de/à] V Ω : Marie apporta son aide à soigner les blessés, La certitude de réussir son examen le rendait prétentieux.

The N which is adjoined by r_{N10} belongs to one of the following subclasses:

1. The same subclass (l'idée, le regret) as noted in r_{N9}. In certain positions (e.g. in Il y a N) some of these N can occur without a determinant: Il y a avantage à traîter cette affaire rapidement.

2. Verbs which occur with Ω_{11} (N de V Ω), occurring here in their nominalized form Vn : aide, obligation, encouragement, invitation, incitation.

3. Another subclass of N such as is illustrated by enuie, besoin, façon, goût, plaisir, douleur, soif, rage: (1) La rage de vivre le possédait, (2) Le besoin de manger est naturel. In example (1), we could consider N de V Ω as an expression: la rage de vivre, le goût de vivre. In example (2), we might consider N de (le besoin de) as an adjunct of $C_1 = \Sigma$ tV Ω (where Σ = V): manger est naturel. Similarly, in other examples: (La joie de) nager la rendait jolie, (Le plaisir de) tuer le rend fou.

A certain number of r_N are sometimes separated from N. For instance, if N is the Σ in $C_1 = \Sigma$ tV Ω, r_N can follow tV Ω. In this case tV Ω is always short and often in the passive (Une hypothèse est presentée ici qui permet à ...). Otherwise, one is more likely to find this possibility in literary texts: Les flots le long du bord glissent, vertes couleuvres.

VII. LEFT ADJUNCTS OF N : ℓ_N

ℓ_{N1} = A Cette lettre nous apprend une terrible nouvelle.

Different types of qualifying and numerical adjectives, including some compound adjectives, occur as ℓ_N : Les trois chaises sont cassées, La dixième page est raturée, Le tissu a une triple épaisseur, C'est l'avant-dernière répétition. A agrees with N. Generally A = ℓ_N also occurs as A = $\Omega_{\hat{e}tre}$ (La nouvelle est terrible).

1. The following observations concern the choice as to whether A occurs to the left of N (as ℓ_N) or to the right of N (as r_N). Short adjectives appear more frequently as ℓ_N than as r_N : une dure expérience, un court chemin. An A which adjoins a proper noun always occurs to its left: la vilaine Marie, le gai Paris. For stylistic effect, A of color can occur in the ℓ_N position: les vertes années, les rouges tabliers. When A is derived from a verb such as aimer, détester, admirer by means of a suffix it can occur as either r_N or ℓ_N : une aimable personne, un admirable paysage. When A is similarly derived from a verb such as réaliser, laver, repasser, façonner, only rarely does it occur as ℓ_N : une serviable enfant, une nuisible action, ≠ un lavable tissu, ≠ un réalisable projet. But certain A derived from a subclass of these verbs by means of both a suffix and a prefix can occur as ℓ_N : un irréalisable projet, une indivisible propriété. In cases where the meaning of A differs depending on its position (ses propres mains, des mains propres) and in cases where A supports a metaphorical meaning if it occurs as ℓ_N (un fin joueur, un triste sire, un joli gâché) one cannot say N $tV_{\hat{e}tre}$ A without changing the meaning or without losing the metaphoric meaning.

2. If there are several adjectives in the ℓ_N position, there are no commas between them (une bonne grosse soupe).

3. Concerning the indefinite adjectives (A_{ind}) :

3.1. Certain indefinite adjectives (certain(e), quelques, tout (m/f,s/pl), même(s), autre(s), tel (m/f,s/pl)) can occur in the ℓ_N position: Un certain sourire. They do not occur as $\Omega_{\hat{e}tre}$ (≠ Ils sont quelques) except for tel, autre (Telle est mon opinion). When certain or nul occur as $\Omega_{\hat{e}tre}$ they occur as A not

A_{ind} : Je suis certaine de cela ≈ Je suis sûre de cela; Ce travail est nul ≈ Ce travail est sans valeur. (Note that when nul occurs as A_{ind} it does not occur as ℓ_N : ∄ Une nulle personne.) Also, l'autre and le même as $\Omega_{être}$ occur as pronouns, not A_{ind} : C'est l'autre qu'elle veut. (Cf. also II, Σ_1, 1.)

3.2. Depending on the particular A_{ind} there are restrictions on the determinant: une certaine personne, ∄ la certaine personne; Nous rencontrerons toute [la/sa] famille, Nous rencontrerons toutes [les/ses] filles, Nous rencontrerons toute une famille, ∄ Nous rencontrerons toutes des familles.

3.3. Tout occurs as ℓ_N but to the left of the determinant T : Toute la troupe est partie, ∄ La toute troupe est partie. The excision of tout to the left of T N does not always seem to be possible: Il reprend son souffle tous les 20 mètres, De toutes les modes c'est celle-ci que je préfère. Tout, quelque, même are also adverbs.

ℓ_{N2} = N P Une majorité de ministres ont voté pour lui.

1. The case where N in N P is a collective noun N_{coll}.

1.1. P is usually [de/des]. But before a pronoun, P = d'entre : Une majorité d'entr'eux ont voté pour lui. Note that after the excision of ℓ_{N2}, N no longer has a determinant.

1.2. N_{coll} (foule, multitude, ensemble, troupe, quantité, partie, tas) requires that the following N be a plural N or a mass N : un tas de pierres, un tas d'or.

1.3. If N_{coll} is preceded by T such as le or ce, then N_{coll} de N is analyzed as N followed by r_N = de N : La majorité (des ministres) a voté pour lui. If N_{coll} is determined by un, une, des, we can have de N = r_N or N_{coll} de = ℓ_N : Un grand nombre (d'élèves) est reçu, (Un grand nombre d') élèves sont reçus. The excision ℓ_N appears natural when N_{coll} is singular and the verb is plural, as in the second example, above. Also, when N_{coll} [de/des] N occurs in the Ω position, if the r_N excision is made, the remaining sentence occasionally seems incomplete: Il amassait un tas (de feuilles), L'enfant a mangé une quantité (de pommes).

2. The case where N P is a subclass of the type sorte de, espèce de, type de, genre de : Cette sorte de livres ne sont pas bons à lire. In certain

other cases of N P the ℓ_N excision seems more natural than the r_N excision, e.g. with N de such as le mois de, la ville de, le jour de, l'âge de : Les cas se déclarent avant l'âge de 15 ans. But as with N_{coll} it may not be necessary to extend the string ℓ_N = N P to cases other than those in which agreement of the verb with N_2 of N_1 P N_2 require it.

$\ell_{N3} = D_q$ de : Beaucoup d'élèves sont reçus à l'examen, Jean a mangé assez de gâteaux.

D_q (adverb of quantity) are such as occur in peu de, assez de, pas mal de, beaucoup de, trop de, moins de, plus de, davantage de. Some of these D_q words occur as Σ and as $\Omega_{être}$ (depending on $\Sigma_{être}$) without (de) N being present: Beaucoup périrent en mer, Elles sont assez. It should be noted that if D_q de N is Ω, the part de N must be present but it may be in its pronominal form en : Ils ont reçu beaucoup d'élèves, Ils en ont reçu beaucoup. After the excision of ℓ_{N3}, an article is missing to the left of N because D_q acts as a determinant of N.

VIII. ALL-POSITION ADJUNCTS OF N : a_N

This set of adjuncts of N is distinguished from r_N and ℓ_N by the variety of positions that it can occupy in the sentence. Mainly, it occurs to the left or right of N, set off by a comma. a_{N1-4} can be said to contain a zeroed "étant" as shown in parenthesis. a_{N1-3} agree in number and gender with N.

a_{N1} = A (étant A) : Tranquilles, les bêtes paissaient dans le pré; Jean, distrait, se trompa de chemin; Il faisait vite sa valise, heureux de partir.

a_{N2} = N(étant N) : Artiste, Jean souffrait de voir tant de laideur; La rue de Passy, le centre commercial, est très animée.

a_{N3} = Vé Ωé (étant Vé Ωé) : Elus délégués, les dix mécanos représenteront tous les ouvriers; Elles passeront en justice, considérées comme responsables de l'accident.

a_{N4} = P N (étant P N) : En cholère, elle a tué le chat.

a_{N5} = N/Pro : Il va dire un mot à ce type, Pierre; Tous, nous sommes mortels.

a_{N5} represents the case in which the subject or object is repeated. The position of this adjunct of N varies. It may occur before Σ, after Σ, or after V Ω.

1. The pronoun option can have different forms, as follows. Pro = Pro_p (moi, toi, lui, elle(s), eux, nous, vous), or Pro_{poss} (le mien, le tien, etc), or $Pro_{dém}$ (celui-ci, ceux-ci, celle(s)-ci, cela, celui-là, etc.), or Pro_{ind} (tous, toutes) but not other Pro_{ind} (e.g. aucun). Pro agrees with N.

2. If a_{N5} is N, adjoining a string C, then in C the Σ or Ω that agress with N must be a pronoun: ∄ Pierre va dire un mot à ce type, Pierre; ∄ Cette occasion, Jean ne voulait pas laisser échapper cette occasion. We may also have conjoined sequences of N and Pro occurring as Σ alone or occurring with a corresponding repeating pronoun (in which case either the sequence or the repeating pronoun can be analyzed as a_{N5}): Jean et moi (nous) irons au cinéma, Ni toi ni moi (nous) ne pensons aux vacances.

IX. RIGHT ADJUNCTS OF A : r_A

r_{A1} = P N Jean a renversé une assiette pleine de soupe, Il est fidèle à ses idées.

1. P is usually à, de; sometimes avec, en, pour, envers or other P : un homme célèbre par ses oeuvres. An adjective which occurs with an adjunct P N usually requires a particular preposition (abondant en, adroit à, amoureux de, utile à/pour).

2. The N position of P N can be filled by a pronoun: un homme content de soi. In r_{A1}, when P N = P Vn, often N A P Vn is related to N est A a_C, where a_C = C_s tV N(same V as in Vn), or to N tV D : un objet doux au toucher, L'objet est doux quand on le touche; un animal rapide à la course, L'animal court rapidement.

3. The N-position of P N can be filled by an N-replacement string N_r : Jean est content de ce qui arrive à son fils, La mère est furieuse de ce que son enfant a fait. In this case the host A or Va belong to the same subclasses as they do for r_{A2}, below.

4. When the host A = Va (i.e. an adjective derived from a verb), then N_1 Va P N_2 is often related to N_1 tV N_2 : Jean est amoureux de Marie, Jean aime Marie.

5. Certain adjectives never have adjuncts (plénier, marginal, bot) while others hardly ever occur without r_A (enclin, exempt). The meaning of A can change depending on whether or not r_A occurs: une table propre, une table propre au dessin. (This case of A P N was noted in $\Omega_{être}$.)

r_{A2} = que C Jean est content que son fils lui ressemble.

1. A belongs to a subclass (heureux, furieux, coupable, conscient). Que C is in the indicative with A such as sûr, certain, conscient. In other cases que C is in the subjunctive: Elle est sûre que Pierre est son fils, Elle est fière

que Pierre soit son fils.

2. In the formula N $tV_{\hat{e}tre}$ A que C, N is an animate noun (or an aggregate noun: assemblée, groupe, classe, troupeau, bande).

3. In such sentences as La mère est attentive à ce que son enfant ne joue pas avec les allumettes, we can analyze the portion [à/de] ce que C as a variant of que C. A belongs to a subclass of Va derived from such verbs as consentir à, se résoudre à, faire attention à, s'indigner de, se réjouir de, s'émouvoir de.

r_{A3} = [à/de] V Ω : Ils étaient heureux de partir en vacances.

1. One possibility is that the host A is a member of the same subclasses as were noted for r_{A2}. In this case, N $tV_{\hat{e}tre}$ A [à/de] V Ω is often related to N $tV_{\hat{e}tre}$ A a_C : Ils étaient heureux parce qu'ils partaient en vacances.

2. Another possibility is that the host A of r_{A3} is an aspectual A (apte, prêt, enclin) as noted in $\Omega_{\hat{e}tre3}$,3. : Jean est apte à traduire ce livre.

r_{A4} = [à/de] V Ω / [à/de] V Ω^{-N} : Ce garçon est certain de triompher,
Ces chaussures sont bonnes à jeter.

A P V Ω / A P V Ω^{-N} were treated as special cases of $\Omega_{\hat{e}tre3}$ (V, $\Omega_{\hat{e}tre3}$,2) in which A is a member of a subclass of A_S (facile, difficile, utile) or of related A-subclasses. Since it is not always possible to excise the portion P V $\Omega^{(-N)}$ (where P = à, de), the adjunct status of this form is questionable.

r_{A5} = D : Marie est gentille au possible.

Adverbial expressions sometimes occur as r_A : bête au dernier point, gai en diable. More rarely, e.g. in literary contexts, a single adverb occurs as r_A : "Il était de santé délicate, pâle extraordinairement, il avait..."

X. ADJUNCTS OF A, D, AND Q: ℓ_A, ℓ_D, ℓ_Q, r_Q

ℓ_A = D : Jean porte une valise assez lourde.

There are several possibilities for D = ℓ_A.

1. D is an adverb (or adverbial expression) of intensity: assez, peu, bien, fort, si, très, trop, tout, vraiment, affreusement, atrocement, faiblement, plus ou moins, à peine, tout à fait, un tant soit peu. Note that the adverbs autant and beaucoup do not occur as ℓ_A : ≠ Elle est [beaucoup/autant] gentille. Tout is invariable but takes the feminine marker if A begins with a consonant: Elle était toute contente, une pièce tout ovale.

2. D belongs to a subclass of adverbs of opinion or of time: cependant, néanmoins, pourtant, quelquefois, parfois, toujours, souvent, rarement, désormais, sûrement, volontiers, sans-doute, vraisemblablement, certainement.

3. D is an adjective used adverbially, usually to the left of Va : Des femmes [court vêtues/fin prêtes]. These adverbs are invariable, except for a small number (frais, grand, bon, large) which agree (masc/fem, sg/pl) with A : Les fenêtres grandes ouvertes.

4. D = plus/moins of the comparative and superlative forms.

ℓ_D = D : Jean est très peu malade, Le tableau est tout de travers, Il habite bien loin, Marie conduit trop vite.

D belongs to the same class as noted in 1. of ℓ_A. The host D (to which ℓ_D is adjoined) can be occurring as ℓ_A, or $\Omega_{être}$, or Ω_{20}, or a_V. The subclasses of adverbs of time and of opinion that can occur as ℓ_D can also occur in other positions in the sentence and are therefore also classed as a_C.

ℓ_{Q1} = D : Il y a environ 50 élèves dans la classe, Il y a juste 25 mètres d'ici à là, Ils sont au moins 50.

D is an adverb of degree: à peine, au moins, plus, au minimum, à peu près,

environ, juste, moins de, plus de, plus ou moins, quelque, près de. It occurs to the left of Q N / Q N_m / Q.

ℓ_{Q2} = N_d de : Une profondeur de 10 mètres paraît beaucoup pour une piscine.

N_d is a noun of dimension such as: longueur, largeur, hauteur, épaisseur, volume, surface, étendue.

1. N_d de is an adjunct of Q only when Q occurs in Q N_m : ≠ Une profondeur de 10 paraît... . It could be said to adjoin the string Q N_m.

2. In excising N_d de (une profondeur de) as adjunct of Q in Q N_m in the above example, we have a resultant center string 10 mètres paraît beaucoup (pour une piscine). This seems more acceptable than a center string Une profondeur paraît beaucoup (pour une piscine), which would result from the analysis of de 10 mètres as a P N adjunct to the right of N (profondeur). To eliminate the latter analysis in favor of the former, it is necessary to state that N_d does not occur as Σ_1 or as Ω_1 if it is followed by de Q N_m .

r_{Q1} = (de)...à Q (N_m) : 5 à 6 élèves sont reçus, Jean dépense de 10 à 20 francs par jour, On compte de 90 cm. à 1 mètre de tissu pour faire une jupe.

r_{Q2} = D : Il y a 50 mètres au plus d'ici à là, Il y a 50 élèves environ dans la classe.

D belongs to the degree subclass (environ, au moins, etc.) but if Q occurs in Q N or Q N_m then D is to the right of Q N / Q N_m : ≠ Il y a 50 environ élèves dans la classe, ≠ Il faut 90 environ centimètres de tissu pour faire une jupe.

r_{Q3} = de N_d : 10 mètres de haut sont une bonne mesure pour un arbre.

N_d is a dimension noun. This string occurs to the right of Q N_m.

XI. ADJUNCTS OF THE VERB: a_V

a_{V1} = P N Il parlait avec ferveur de sa découverte.

1. When N has no determinant, P N modifies the verb as an adverb and occasionally forms a verbal expression: chercher à tâtons, crier à tue tête. When it is detached from the verb by commas P N = a_C : Avec ferveur, il parlait... . When N is preceded by a determinant, P T N can be in the a_C position: Avec une grande ferveur il parlait de sa découverte.

2. When P N = [pour/à] N (indirect object) it can occur as P N or in pronominal form. The pronoun form precedes the verb (or the auxiliary verb) according to the customary rules (cf. IV): Il écrit une lettre à Pierre, Il nous raconte une histoire. However, if the verb is in the passé composé and the indirect object pronoun is a repetition of the subject, then the auxiliary is not avoir but être: Je me suis coupé du pain, ≠ Je m'ai coupé du pain, ≠ Je suis coupé du pain (pour moi).

3. The pronoun en can represent an adjunct of the verb: Il s'en evade (e.g. de la prison). En occurring as an adjunct of the verb precedes tV according to the rules described for en in IV.

a_{V2} = D : Jean travaille beaucoup, J'ai presque oublié ce refrain.

When D is an adjunct of the verb, it occurs after the verb if the verb is a single word. If the verb is in the composite form, then the position of D depends on which D subclass occurs. D = adverb of time or of place usually occurs after the auxiliary and verb (Jean s'est levé tôt). D = adverb of quantity or of intensity usually occurs between the auxiliary and the verb (Jean a beaucoup travaillé).

Several factors contribute to the variable position of verb adjuncts. For example: (1) The pronominalization (en) of [de/à/pour] N shifts the position of its occurrence from after the verb to before the verb; (2) certain adjuncts change from r_V to ℓ_V when the verb changes from tensed form tV to past participle Vé. We have for the moment treated all cases of verb adjuncts as variable position adjuncts a_V.

XII. ADJUNCTS OF C (CENTER STRING): a_C

a_{C1} = D : Ces opérations sont désormais indolores, Jean n'aime pas Marie.

1. D = sentence adverb (of opinion, of time, of manner, or adverbial phrase) which can occur in different positions in the sentence: Désormais ces opérations sont indolores, Ces opérations, désormais, sont indolores. Included among the sentence adverbs are some (e.g. cependent, toute fois, donc) which also occur as conjunctions (XIII, r_{X1},3). Often when the adverb precedes the subject, there is an impression of inversion (En vain vous l'attendiez). A form which emphasizes the inversion is D que Σ tV Ω (Peut-être que Paul viendra).

2. D = adverb of negation (D_n). D_n has a specific location in the sentence:

2.1. Σ ne (Ω^P) tV pas (Vé) Ω.

(a) In cases of negation of the type ne...pas, ne...point, ne..guère, ne...jamais, ne...plus the two elements of D_n surround the verb or the auxiliary être or avoir, or (if there is an Ω^P) the group Ω^P tV : Jean ne porte pas les valises, Jean n'a pas porté les valises, Jean ne les a pas portées.

(b) Any Ω can appear in a negative sentence but [un/une/des/du/de la] N occurring as Ω_1 becomes de N (Je ne porte pas de valise, ≠ Je ne porte pas une valise) or else the sentence is completed by a contrastive construction: Je ne porte pas une valise mais un sac. Thus for Ω_3 : On ne distingue pas les jumeaux à ce que l'un est blond et l'autre roux mais à ce que l'un est droitier et ... .

(c) Restriction on negation in C: In C_3 = Ω tV Σ the form of the negation is usually Ω ne tV pas Σ, but if Ω = A / A P N / Vé Ωé par N, the form is pas Ω (ne) tV Σ : Pas ronde est la terre. D_n does not occur with C_4 (≠ ne voici pas N) except in the forms Ne voilà-t-il pas N or N'en voilà pas beaucoup. In C_6 = Il y a tV_{avoir} N, D_n is often ne ... personne/rien : Il n'y a personne.

2.2. Σ ne tV (Vé) que Ω.

(a) In cases of negation with ne ... que the elements of D_n have the same position as in 2.1, but if the verb is conjugated with être or avoir, que occurs after the group $tV_{avoir/être}$ Vé : Je ne porte qu'une valise, Je

n'ai porté qu'une valise. With this negation Ω^P does not occur: ≠ Je ne la porte que.

(b) ne ... que does not occur with:

Ω_6 : ≠ Il ne pensait que que C.
Ω_{16} : ≠ Jean ne sait que quand C.
Ω_{17} : ≠ Ils n'ignorent que qui l'on soupçonne.
Ω_{18} : ≠ Je ne pense qu'utile que C.
Ω_{19} : ≠ Je ne trouve qu'idiot de ....
Ω_7 (for V of type prier) : ≠ L'enfant ne prie que son père que C.
Ω_9 (for V = croire) : ≠ Je ne crois que rêver.

In the cases of $\Omega_{3,5,11,12,14}$, que can occur preceding Ω or between the elements of Ω. For example: Ils ne réduisent que ce pays à la famine, Ils ne réduisent ce pays qu'à la famine.

(c) ne ... que occurs in C_1 (with the above restrictions on Ω), C_5 and C_6. In C_2 ne ... que does not occur if the verb is not in the past tense: ≠ Jeanne ne se qu'évanouit, Jeanne ne s'est qu'évanouie. Ne...que occurs in C_4 in ne [voici/voilà] que N and in n'en voilà que X_q (X_q a word or expression of quantity) but not in other forms of C_4 : ≠ Ne le voici que... . In C_7 the use of ne ... que is rather rare: Il n'est que temps qu'il parte à la gare, ≠ Ça n'arrive que qu'il... .

3. The two elements of D_n (ne pas) usually precede the verb when it is in the infinitive: Jeanne préfère ne pas manger de gâteaux, Elle prétendait ne pas avoir rencontré Paul.

4. In certain cases, ne can be used alone:

(a) Before the verbs cesser, oser, pouvoir occurring with Ω = (de) V Ω : Jean ne cesse de parler, Marie n'ose le faire, Jean ne peut dire que Marie ne l'aime pas. And before the verb savoir occurring with Ω = Que V Ω/Qui C/QU_{int} C : Jean ne sait que faire, Elle ne sait qui le lui a dit, Marie ne sait quand Paul reviendra.

(b) When two negations are separated by ni, or when ni is repeated: Pierre ne parle ni ne mange, Ni Jean ni Paul ne viendront.

(c) After que (= pourquoi) and qui used interrogatively: Que n'est-il arrivé à temps ..., Qui ne serait triste de cette nouvelle ?

(d) After depuis que or [il y a/voici/voilà] X_t que (where X_t is a time expression) : Depuis que je ne l'ai vu ..., Il y a six mois que je n'ai vu Paul.

(e) With Ω = personne, rien, aucun N : Jean n'aime personne.

5. When the negation applies to a term (A/N/D) of the sentence, the position of the negative marker (non, pas, jamais or composite non pas, non point) is to the left of A/N/D : C'est une femme pas très belle.

a_{C2} = N Il aime, la nuit, se promener sur les quais, L'hiver le ciel est souvent gris, Ils se sont rencontrés trois fois cette semaine, coincidence qui lui paraît étrange.

a_{C2} includes two very different cases:

1. N is a time noun N_t sometimes standing alone (le jour, la nuit, l'été, l'hiver) and sometimes with particular adjuncts (le jour de Pâques, ce jour-là, l'été dernier, l'hiver passé). Generally $a_{C2} = N_t$ occurs at the beginning of the sentence.

2. N is a word of the type phénomène, processus, évènement, coïncidence, standing in apposition to an entire sentence (possibly nominalized): Nous avons signaler son raccourcissement lors de la contraction des myonèmes, phénomène très rapide qui est suivi d'... .

a_{C3} = P N Les hommes, à la campagne, vivent selon les saisons; Marie entrera à l'université après Noël; A son teint, on voit que Paul est malade.

1. P N can have different positions in the sentence:

A la campagne, les hommes vivent selon les saisons.
Les hommes vivent, à la campagne, selon les saisons.
Les hommes vivent selon les saisons, à la campagne.

2. N is described in Σ_1 and Ω_1 ; however, if N occurs in the form of a pronoun (Pro), then Pro ≠ je, tu, il, ils; me, te, ...; on, nul, tel, autrui; en, y.

3. The prepositions are grouped here into semantic classes as an aid to a further transformational study.

3.1. P = à, de, en, dans, vers, depuis, par, auprès de, contre, parmi, sous, sûr, à partir de. P N indicates place (location, direction): à la campagne, de Paris, contre le mur.

3.2. P = à, de, en, dans, vers, depuis, par, après, dès, durant, depuis, à partir de, au début de... . P N indicates time (date, duration): à l'aube, en deux ans, par une nuit étoilée.

3.3. P = à, de, en, par, avec, grâce à, au moyen de. P N indicates means or distinguishing type: à son teint, de caractère, avec la voiture, par ruse.

3.4. P = de, en, à la façon de, à la manière de, d'une façon A. P N indicates manner: de face, en short.

3.5. P = de, pour, au profit de. P N indicates the cause (motive, intention) or attribution: de dépit, pour le bal.

4. In a_{C3} we also have P N in which the N-position is filled by N_s (que C): Avec le désir que Pierre vienne, Marie lui téléphonait.

5. (avec) N P N (≈ ayant N P N) : Révolver au poing, Octave tient la foule en respect. Here a_{C3} is similar to a_{C4} : Parce qu'il avait un révolver au poing.

$a_{C4} = C_s\ C_{1-7}$: L'enfant est malade parce qu'il a trop mangé, Jean dormira avant que tu reviennes.

(where C_s = subordinate conjunction)

1. The position of a_{C4} is variable: L'enfant, parce qu'il a trop mangé, est malade.

2. When two a_{C4} strings are conjoined que can sometimes replace the

repetition of C_s : Quand il pleut et qu'il tonne le troupeau s'enfuit.

3. The following are examples of a_{C4}, illustrating the most common C_s and those that require the subjunctive. The conjunctions are grouped semantically as an aid to transformational work which may follow.

3.1. Time: Quand il pleut Jean va au cinéma, Je voudrais le voir avant qu'il parte. C_s : quand, lorsque, après que, dès que, avant que, au moment où, à l'instant où, du jour où, une fois que; and taking the subjunctive: avant que, sans attendre que, jusqu'à ce que.

3.2. Cause: Comme Marie ne l'aimait plus Jean l'a quittée. C_s : parce que, puisque, comme, du fait que, c'est que, vu que; and taking the subjunctive: non que...mais..., non pas que...mais... .

3.3. Hypothesis: Jean partira en Afrique si Marie accepte de venir. C_s : si, quand, que, si seulement, même si, quand même, au cas où, pour le cas où, à supposer que; and taking the subjunctive: à supposer que, en admettant que, à moins que, soit que...soit que..., que...ou que..., pourvu que, pour peu que, si tant est que.

3.4. Consequence: Ils faisaient du bruit au point que l'enfant n'a pas pu dormir, Il parle de manière que tout le monde le comprend (fait réel), Il parle de manière que tout le monde le comprenne (il veut qu'on le comprenne). C_s : de (telle) sorte que, en sorte que, de (telle) façon que, de (telle) manière que, si bien que, sans que. In a related form, the conjunction may be of the type que, pour que, au point que occurring with a word marking the intensity of V or of an object A/D/N : Jean travaille tellement qu'il est fatigué, Jean est si gentil que tout le monde l'aime, Jean est dans une telle colère qu'il n'écoute plus rien. This form is very close to the comparative.

3.5. Finality: Marie a ouvert les fenêtres pour que l'air soit renouvelé. C_s : afin que, pour que, de peur que, de crainte que. The subjunctive is generally required. This string often occurs in C9: Sortez pour qu'il soit sage! The conjunction C_s may be que: Viens, que je te parle!

3.6. Concession, opposition: Quoiqu'il fasse, il le fait bien, Si fatigué que je me sente, j'irai avec vous. C_s : alors que, bien que, encore que, quoique, même si and the expression: avoir beau (J'ai beau chercher mon chapeau je ne le retrouve pas).

3.7. Addition, exception: Outre qu'elle est gentille, elle est belle et drôle; Ces jumeaux se ressemblent beaucoup, sauf que leurs yeux ont une expression différente. C_s : outre que, sans compter que, non sans que (subj), excepté [que/si], sauf [que/si], sinon que, si ce n'est que, à moins que (subj).

$a_{C5} = C_s\ (\Omega^P)\ V\ \Omega$ Jean va au cinéma sans le dire à Marie, Il travaille au point d'en être malade.

C_s is slightly different from C_s in a_{C4}. For example, pour que → pour, de façon que → de façon à. C_s : de manière à, de façon à, en sorte de, sans, pour, afin de, de peur de, de crainte de, au point de, avant de, au moment de, à l'instant de, sans attendre de.

a_{C6} = en Vant Ω : Jean se rend odieux en parlant sans cesse de lui.

1. The position of a_{C6} is variable: En parlant sans cesse de lui, Jean..., Jean, en parlant sans cesse de lui, se... .

2. Tout can precede a_{C6} : Tout en tricotant elle regarde la télévision.

a_{C7} = Vant Ω : Faisant son marché, Jeanne rencontra Jean; La tornade est passée, ravageant tout sur son passage; Paul, refusant de circuler, a été arrêté.

1. a_{C7} is close to r_{N7} but a_{C7} is mobile and separated from N by commas.

2. a_{C7} is close to a_{N3} but is not related to an underlying sentence N est $\Omega_{\hat{e}tre}$. Also a_{C7} always has a variant with a conjunction: Parce qu'il refusait de circuler, Paul a été arrêté. Another variant is en Vant Ω : En faisant son marché... .

a_{C8} = N Vant Ω Jean annonçant son retour, Marie retrouve la joie de vivre; Les fruits étant tous cueillis, il ne reste plus qu'à aller les vendre au marché.

1. N = Σ of Vant.

2. a_{C8} resembles a_{C4} : <u>parce que Jean annonce son ...</u>

3. a_{C8} usually occurs to the left of C.

a_{C9} = D C <u>Je me suis trouvé mal, tant il faisait chaud</u>.

1. Small subclass of D : <u>tellement</u>, <u>tant</u>.

2. a_{C9} usually occurs to the right of C.

a_{C10} = tV-Σ Ω <u>Fût-il beau, je ne l'aimerais pas</u>, <u>Dût-il pleuvoir, je sortirais</u>.

1. V (in a_C) = <u>être</u> or <u>devoir</u> in the imperfect subjunctive.

2. Σ (in a_C) = Σ^P, and Ω = $\Omega_{\text{êtrel,2,3}}$ or (en) V Ω .

3. a_{C10} is close to a_{C4} : <u>Même s'il était beau...</u>, <u>Même s'il devait pleuvoir...</u> .

4. a_{C10} is to the left of C.

a_{C11} = $C^{cond.}$ <u>Jean serait sérieux, tout le monde l'aimerait</u>.

1. The verb is in the conditional (indicated by the superscript "cond.")

2. The center string C_4 does not occur in a_{C11}.

3. a_{C11} is close to a_{C4} : <u>Si Jean était sérieux...</u> . a_{C11} occurs to the left of C.

a_{C12} = [de/à] V Ω <u>Jean, à lire dans le noir, s'est usé la vue</u>, <u>De la</u>

savoir seule, l'inquiétude l'étreignait, Il a gaspillé de l'argent à jouer aux courses.

1. The (zeroed) subject of the infinitive verb in a_{C12} is the same as the subject or the object of the verb in the host string. a_{C12} can occur in various positions in the host string.

2. a_{C12} = de V Ω is close to a_{C4} : Parce qu'il lit dans le noir, Jean s'est usé la vue, or: L'inquiétudes étreignait Marie parce qu'elle savait que Jeanne était seule. a_{C12} = à V Ω is close to a_{C6} (en V Ω) : Il a gaspillé de l'argent en jouant aux courses. Other examples of à V Ω which can be analyzed as a_{C12} (rather than r_A or r_N) are: Jean est content de partir en vacances, Il est le premier (élève) à recevoir ce prix, Nous étions (les) quatre (personnes) à attendre.

a_{C13} = Il y a N_t : J'ai vu ce film il y a trois ans.

1. N_t = a time noun or expression, such as trois ans, des années, un siècle, une heure.

2. a_{C13} can occur in different positions in the host string.

a_{C14} = tV Σ C'est idiot, pensa Jean, de croire cette femme.

1. Verbs here are of the type dire, penser, croire, estimer. The string is set off by commas.

2. With some verbs (e.g. dire) the indirect object is present: ,lui dit-il, ,se dit-il, ,dit-il à Paul.

3. When Σ is in pronominal form Σ^P, the order is sometimes Σ^P tV : ,je pense, ,j'estime, .

a_{C15} = [Pour/quant à] N Pour le visage, je l'ai carré, Quant à la coiffure, nous la laisserons souple.

a_{C15} generally occurs to the left of the host string C. The occurrence of N in C is then in pronominal form.

a_{C16} = [Pour/tout/si] [A/D] $tV_{être}$ Σ : Si gentil soit-il, elle ne l'aime pas.

a_{C17} = [Pour/tout/si] [A/D] que Σ tV : Pour vite qu'il coure, il ne la rattrapera pas.

a_{C18} = [Tout/quel/quelque] N que Σ tV : Quelque décision qu'il prenne, il n'obtient rien.

a_{C19} = ce QU $C_1^{-\Sigma/\Omega}$: Il est revenu plus tôt que prévu, ce qui nous a beaucoup plu.

(where QU = qui, que; and $C_1^{-\Sigma/\Omega}$ signifies that C_1 occurs with either the Σ or Ω position empty).

This string stands in apposition to an entire center string. It resembles a_{C2}, case 2, but here ce occurs instead of (as in a_{C2}) a special subclass of N (phénomène, etc.).

In certain cases the connective between a_C and the host C is que, yielding a sequence a_C que C : A peine es-tu sorti que Pierre est arrivé, Le repas n'est pas terminé que j'ai envie de fumer, Vous étiez donc malade, qu'on ne vous voyait plus, Vous le diriez à Paul qu'il ne vous croirait pas. The a_C string in these cases requires further definition.

XIII. RIGHT ADJUNCTS OF X: r_X

The adjuncts r_X, adjoined to the right of X, have the form C_c X or C_{cm} X, where X is a string or string-segment, C_c is a coordinate conjunction, and C_{cm} is a comparative conjunction.

$r_{X1} = C_c$ X : Marie aime le beurre et le fromage.

1. The main subclass of coordinate conjunctions has the elements et, ou, ni, mais and comma , . For example:

mais A (X = A) Jean est beau mais triste.
et N (X = N (Ω)) Marie aime le beurre et le fromage.
(X = N (Σ)) Le chien et le chat sont des mammifères.
et tV (X = tV) Jean mange et boit trop.
ou P N (X = P N (r_N)) Elle choisit un cadeau pour Jean ou pour Paul ?
mais P N (X = P N (a_C)) A New York mais pas à Paris, le ciel est bleu.
et Ω (X = Ω) Jean est malade et à l'hopital.
, C_1 (X = C_1) Les ouvriers occupèrent les usines, les étudiants envahirent les universités et des soldats désertèrent.
et D (X = D) Jean parle trop et vite.
et N (X = P N) Il l'a charmée par ses gestes et ses paroles.

The choice of C_c involves restrictions on r_{X1}. For example if X = A and C_c = et : Jeanne est belle et gentille, ≠ Jeanne est belle et laide. Or if C_c = ou : Jeanne est triste ou gaie, ≠ Jeanne est triste ou gentille. However, such combinations can occur in a more complete sentence: Jeanne est belle le soir et laide le matin, Jeanne est belle et laide à la fois, Jeanne est belle quand elle rit et laide quand elle pleure.

2. Another type of C_c includes or, car, donc. The conjunctions car and or occur only if X is a center string C : Jean n'est pas venu car il pleuvait. Donc can conjoin elements of C, and can also occur in positions other than that defined for C_c, and it can be combined with et, ni, or (et donc ...) : Jean est beau, il est donc heureux; Ni à New York ni donc à Paris,... . This type of C_c (or, car, donc) can also begin a sentence that is separated from the preceding

one by a period: Toutes les femmes sont belles. Or Marie est une femme. Donc Marie est belle.

3. Another type of C_c occurs as C_c but also in other positions in the sentence, and can occur in combination with both types of C_c above. Included are: en effet, aussi, c'est pourquoi, par conséquent, en conséquence, savoir, à savoir, c'est-à-dire que, soit, au moins, du moins, encore, seulement, au contraire, cependant, d'ailleurs, en revanche, pourtant, néanmoins, toutefois, non seulement...mais encore..., soit...soit..., tantôt...tantôt... : Jean est fatigué pourtant il continue son voyage.

4. Another type of conjunction has the form of a mark of punctuation, e.g. ";", ":". Generally this type of conjunction, which we have designated M, does not occur more than once in a sequence of conjoined strings (as does the comma, for example). Very often M = ":" will introduce a sequence of elements each of which is conjoined by a C_c of type 1, above: ...l'action de substances affectant la respiration: inhibiteurs comme le cyanure..., et activateurs tels que le dinitrophénol... . The occurrence of ":" in such sentences can be replaced, without a change in meaning, by expressions such as par exemple, en particulier. For this reason, these expressions have also been classed as M.

$r_{X2} = C_{cm}\ X$: Cet arbre est plus vert que celui-ci, Paul est moins fort que Pierre, Jeanne est aussi gentille que Marie.

1. C_{cm} has two parts. The first part of C_{cm} is an adverb (plus/moins/aussi). The second part is que. The element X to which the comparison applies occurs either between the two parts of C_{cm} (plus...que, moins...que, aussi...que) or followed by the two parts (e.g. ...plus que). C_{cm} also includes plutôt...que, mieux...que : Il est plutôt bête que méchant, Il a mieux travaillé que Paul. If the adverb part of C_c is plus/moins, it may be preceded by ℓ_D = beaucoup, encore, de beaucoup, bien : Jean est bien plus gentil que sage. If the comparative form includes comparisons of manner as well as degree, C_{cm} can include comme, comme si, de même que, ainsi que, autant que : Jean est sage comme une image, Jean est sage comme Marie; and in a form close to a_C : Comme Marie, Jean est sage.

2. The comparative conjunction can be viewed as a conjunction between two sentences. Then, because of zeroing we find different string segments following C_{cm}, for example $A/N/D/C_1$: Jean est plus gentil que sage, Jean est plus gentil que Paul, Jean est plus gentil qu'hier, Jean est plus gentil que je ne le croyais.

3. A special case that closely resembles a_C and r_{X2} is the following:

Plus..., plus... Plus il travaille, plus il gagne d'argent.
Moins..., moins... Moins il travaille, moins il gagne d'argent.
Plus..., moins... Plus il travaille, moins il gagne d'argent.
Moins..., plus... Moins il travaille, plus il gagne d'argent.
Autant..., autant... Autant on l'aimait, autant on le déteste maintenant.

Part 2: Excision as a teaching-oriented form of string analysis; comparison of French sentences with their English translations

Section I of Part 2 presents the string analysis of the sentences of a passage from a French text (Brachet, Jean, Embryologie Chemique, Masson and Co., Paris, Editions Desoer, Liege, 1944, pp.36-38). The analysis was made using the string grammar of French described in Part 1, above. The method used is essentially the one presented by Henry Hiż in Steps Toward Grammatical Recognition, Advances in Documentation and Library Science, vol. III, part 2 (1961), namely that of "excision," by means of which the strings of a grammar are established:

> We now consider each sentence S as a sequence of morphological word-categories (or sub-categories, or disjunctions of categories, or rarely sequences of categories) s_i. When we are given an arbitrary sentence S, we isolate out of it the elementary part S_0 by asking what contiguous sequences of the s_i can be excised, one sequence at a time, by operations of general or nearly general applicability, the residue of S after each excision being still a sentence of the language. (Z.S. Harris, String Analysis of Sentence Structure, Mouton and Co., The Hague, 1965, p.22)

Here we have used the method of excision to verify the strings of the French grammar, and at the same time to illustrate a practical method useable by students to test and extend their knowledge of the grammatical (string) structure of French sentences. We start with a tentative list of French strings (for example those which have been arrived at in previous applications of the method of excision), and see if we can carry out a step-by-step analysis of each sentence S by excising from S at each step a word string which conforms to a string of the grammar, in the manner cited above. A record of the excisions is kept in the form of a table. Column 1 shows the excised word string. Column 2 shows the string of the grammar to which the word string conforms. Column 3 shows the syntactic position of the string in the sentence (referred to the set membership of the string, e.g. r_N, a_C, r_X, etc.). Column 4 shows the residue of the sentence after the excision. (Each residue should itself be a sentence.) The last residue is the center of the sentence, i.e. conforms to a center string whose structure is noted as the last entry in Column 4. By reading the analysis in reverse order, i.e. from bottom to top and from right to left, it can be seen how the sentence is built up from strings.

It should be noted that in the tabular presentation the order of excising adjuncts (or of adding adjuncts in building up the sentence) is in part arbitrary and in part necessary. This results from the fact that the operations of combining strings are partially ordered. Whenever possible we excise from the right of the sentence toward the left. The syntactic connections of the strings in each sentence (= the necessary partial ordering of excision) are shown in a string diagram of the sentence. The set of string diagrams for the text follows the set of tables of excisions. Where possible (without crowding the tables) a syntactic connection, such as what particular noun in the sentence a given r_N string adjoins, is also indicated in the excision table, by placing the host sentence word in parenthesis beneath the column 3 entry for the given string.

Section II of Part 2 presents the string analysis (excision tables and diagrams) for the sentences of the published English translation of the French passage treated in Section I (Brachet, Jean, Chemical Embryology, Interscience Publishers, Inc., N.Y., 1950, pp. 28-29). The analysis was made independently of the French analysis. The list of English strings used is listed in Appendix A along with examples of the main strings. This list is in the form in which it is input to the N.Y.U. computer program for string analysis of English sentences.*

Several remarks about the use of this grammar for excisions are in order:

(1) Conjunctional strings are not listed in the table of English strings. These are treated by the string program, and in the excisions, by the "XCX" type of analysis presented in Harris' String Analysis, 3.26, and also used to describe the French conjunctional strings in Part 1, XIII. In the diagrams a conjunctional sequence X_1 C X_2 C X_3 is shown as follows:

For example, see BRA(E)S13. (2) Several symbols which occur in sentences of this

* However, the restriction part of the grammar is not shown here. The grammar is described in previous volumes of the String Program Reports series (see back cover) and will appear in a forthcoming volume in the Gordon and Breach series Mathematics and Its Applications.

text have not been included to date in the computer grammar of English (Appendix A), and have been treated here according to the general rules of string analysis. The symbols in question are "( )" and ":". (X) is analyzed as a sequence consisting of a string introducer ( ) and a string-body X. Orthographically, the closing parenthesis is placed after X together with any adjuncts X may have in this occurrence. (BRA(E)S12B).

Automatic Changes.

In following the method of excision, it sometimes happens that the excision of an adjunct or conjunct of an element X of a string S requires a corresponding change in the number or gender of an element Y of S, due to an agreement restriction between X and Y. For example, the excision of 'et N' from 'N et N' may imply such changes as are illustrated in the following examples:

Jean et Pierre dorment → Jean dort
Jean et Pierre sont méchants → Jean est méchant
Jean et Pierre sont brutaux → Jean est brutal

Les femmes et les hommes sont beaux → Les femmes sont belles

In the French analyses presented here, wherever such adjustments have been made after excision, they are noted in the residual sentence by an encircled lower case letter which corresponds to one of the detailed cases listed below. In the case of the English excisions, no changes are made in the residual sentences. However, the occurrence of "ⓐ" in a residual sentence in column 4 indicates that an automatic change would occur at point ⓐ after making the excision noted in column 2. The particular change is noted after the residual sentence in column 4 (e.g., BRA(E)S17.2).

The automatic changes made in the French analyses are:

(a) $V_{plural} \rightarrow V_{singular}$, and $V_{\hat{e}tre}$ A (plural) → $V_{\hat{e}tre}$ A (singular), when 'et N_2' is excised from 'N_1 et N_2' subject. In the second case A may also

change gender to agree with N_1: Marie et Jean sont beaux, Marie est belle.

(b) $N_{measure}$ (plural) in 'un à Q $N_{measure}$' becomes $N_{measure}$ (singular) when 'à Q' is excised: un à deux millimetres, un millimetre. Example: BRA(F)S2.6.

(c) N → un(e) N, when all adjuncts of N have been excised; this follows from the automatic requirement that an N which has no adjuncts at all (and no preceding referent) has an indefinite article. Example: BRA(F)S1.7.

(d) N_{plural} A_1 et A_2 → $N_{singular}$ A_1, when 'et A_2' is excised. This holds where N A_1 et A_2 is derived from N A_1 et N A_2: les acides chlorhydrique et carbonique, l'acide chlorhydrique. Example: BRA(F)S6.4.

(e) de A N → [d'unè/des/du/de la] N, when A is excised: de grosses variations → des variations. Example: BRA(F)S5C.2, S12.5.

(f) Σ ne tV pas de N → Σ tV [du/de la] N when ne...pas is excised (on n'achete pas de pain → on achete du pain). Similarly, il n'y a pas de N → il y a [du/de la/un(e)] N (il n'y a pas de relation → il y a une relation).

(g) [celui/ceux/celle(s)] r_N → celui-ci/ceux-ci/celle(s)-ci (or to celui-là/ceux-là/celle(s)-là) when r_N is excised: celles de la Grèce sont reputées → celles-ci sont reputées.

(h) quelques un(e)s de N → quelques $\emptyset$ (zeroed N) when de N is excised.

In addition, we have related string restrictions on a host which is dependent on an adjunct, or among interdependent adjuncts. For example a noun may be in the position of a host but its adjunct cannot be excised; e.g. in the sentence Ces cellules sont de jeunes globules rouges ou de jeunes globules blancs, we would not excise blancs separately from ou de jeunes globules, since the repeated jeunes globules is simply a carrier for the contrasting adjective blancs, as is evident from the bizarre sentence which results when we try to excise blancs: # Ces cellules sont de jeunes globules rouges ou de jeunes globules. A case of interdependent adjuncts can be seen in BRA(F)S15 and BRA(E)S19 (une combinaison des facteurs génotypiques et phénotypiques) where the adjunct combinaison de cannot be excised independently of the adjunct et phénotypiques without changing the sense. The case is stronger when the excision is grammatically impossible as would be the case here if facteur were singular, e.g. (in English) a combination of a genotypic factor and a phenotypic factor.

Notes on French Sentences

BRA(F)S1.3 Faire suite = V

BRA(F)S1.7 In a more refined analysis, one might take à l'aspect d' as a verb.

BRA(F)S1.8 Ver marin could be treated as a compound noun.

BRA(F)S3A.5 Donner naissance à = V

BRA(F)S3C.2 Where $C_1 = \Sigma_1$ tV Ω_3 (fixer N_1 sur N_2). But sur un support (P N) is perhaps a_{C3}.

BRA(F)S3D.2 The same case as in S3C.2.

BRA(F)S5A.1 In a transformational analysis, encore is an adverb adjoined to the verb différencier which underlies the adjective indifférencié.

BRA(F)S5A.4 In influence sur les larves we have a case of Vn P N where N = Ω of V. Cf. II, Σ_1, 4. Here it is possible to treat P N as an adjunct, but in other cases, Vn P N must be taken as a string.

BRA(F)S6.8 In par l'addition d'agents we have another case of Vn P N where N is the object of V and where it is possible to excise P N (cf. Note concerning BRA(F)S5A.4).

BRA(F)S6.9 In the passive, and in the passive-like form with se (le virage peut s'obtenir par une addition), we sometimes have the choice of considering par N as a form of the subject or as an adjunct "par le moyen de N." This is due to a transformation. We make the excision of par N whenever it is possible to do so.

BRA(F)S7.2 N_1 est Vable par N_2 (La masculinisation est realisable par des agents.) is a transform of N_1 peut être Vé par N_2. Here, as in BRA(F)S6.9 we treat par N as an adjunct.

BRA(F)S8.2 Here we have a zeroed N (substance) with left and right adjuncts. But the excision of the left adjunct would leave a center string X est X (substance est substance); in this case we prefer not to excise the adjunct (seule).

BRA(F)S9A.2 L'activité respiratoire could be considered a case of N A where the A is not excised since the N is semantically weak (II, Σ_1, 4.2).

BRA(F)S10A.2 , QU C_1 is a special case of r_{N6} (cf. VI, r_{N6}, 3.5).

BRA(F)S10B.9 One could say: Les sexes se différencient à un moment.

BRA(F)S11A.5 In the N-position we have N A (déterminisme sexuel). It is not always clear whether a given N A (or N N or P N, etc.) is to be

analyzed as a noun with an adjunct or as a compound noun or noun-string (cf. II, Σ_1, 4.2). Here we have not made the excision of A because of the difference between déterminisme in the phrase déterminisme sexuel, and déterminisme as a noun with no adjuncts.

BRA(F)S13A.1 In en de tels domaines it is difficult to excise the left adjunct (de) tels because the automatic change to an indefinite article (des) does note operate here.

BRA(F)S13B2.1 In the expression en est à ses premiers tatonnements the excision of premiers leaves an uncomfortable sentence (en est à ses tâtonnements) because ses here is tied to the change from verb (tâtonner) to nominalized verb (tâtonnements).

BRA(F)S13B2.8 The excision of en as an adjunct here is problematic. We seem to have a verbal expression en être à [N/Vn] expressing a temporal aspect: en être au commencements/au début/à la fin/à ses premiers essais.

BRA(F)S14A.5 (__) is in apposition to a sentence, or N or A, etc., depending on the case. Here (__) is in apposition to N (nombre). In S3B.1, S5C.1 (__) is in apposition to the sentence (C_1).

BRA(F)S15.1 Concerning the excision of de ces derniers from avec prépondérance de ces derniers, we have a case where the N remaining after the excision of de N seems incomplete. Usually this N is a nominalized verb Vn and de N is its object. Here prépondérance has no verb form but functions like a Vn, as can be seen by replacing it with a Vn like dominance (avec dominance de ces derniers).

BRA(F)S15.3 + N de indicates one of the cases of dependance between an adjunct X (combinaison de) and another adjunct Y (génotypiques) (or an adjunct of Y - et phenotypiques) where X and Y are adjoined to the same host (facteurs).

BRA(F)S16A1.4 In au point de vue chimique, point de vue is treated as a single N followed by an A which cannot easily be excised. (Cf. II, Σ_1, 4.2.)

BRA(F)S16B1.2 The negative particle ne cannot be excised when the subject or object is rien or personne (cf. II, Σ_1, 3). If ne - rien is treated as an adjunct (like ne...pas, etc.; cf. XII, a_{C1}) then rien → quelque chose (automatically) after the excision of D_n.

BRA(F)S16B2.2 In à l'heure présente, we have a case of N A where it is difficult to excise the A (cf. S16A1.4 above).

I. Analysis of a French text.

Brachet, Jean, Embryologie Chimique, Paris et Liege, 1944, pp. 36-38.

Les Bases Chimiques du Déterminisme Sexuel

1. - Cas de Bonellia viridis

On sait que la femelle de ce Ver marin a l'aspect d'un sac de 1
7 à 8 cm. de long auquel fait suite une trompe atteignant
près d'un mètre. Le mâle ne mesure qu'un à deux millimètres et 2
vit en parasite dans l'intestin ou l'utérus de la femelle. Les œufs 3a
fécondés donnent naissance à des larves nageantes qui ne tardent
pas à se fixer sur un substratum solide; avant ce moment, la diffé- 3b
renciation sexuelle n'est pas encore établie (Baltzer); si ces larves 3c
se fixent sur un support quelconque, elles deviennent des femelles;
mais si elles se posent sur la trompe de la femelle, elles deviennent 3d
des mâles. Lorsqu'on immerge des larves dans de l'eau de mer con- 4a
tenant un fragment de la trompe, un grand nombre d'entre elles
se transforment en « intersexuées », c'est-à-dire qu'elles présen- 4b
tent des caractères intermédiaires entre le mâle et la femelle.

Ces intéressantes constatations portent à penser que la trompe 5a1
de la femelle exercerait une influence masculinisante sur les larves
nageantes, encore indifférenciées : effectivement, Baltzer a observé 5a2
que des extraits aqueux de la trompe sont masculinisants ; le fac- 5b
teur actif résiste à l'ébullition et à de grosses variations du pH ;
les extraits à l'acétone sont au contraire inactifs (Nowinski) et 5c1, 5c2
il semblerait donc que la trompe renferme un « facteur hormo-
nal » hydrosoluble. Toutefois Herbst a montré que le virage vers 6
le sexe masculin des larves nageantes peut s'obtenir aussi par addi-
tion d'agents très simples, tels que les acides chlorhydrique et car-
bonique, des traces de cuivre, le magnesium, le potassium. La 7
masculinisation est donc réalisable expérimentalement par des
agents variés. Il est vraisemblable que la substance encore incon- 8
nue, présente dans la trompe, est la seule physiologiquement
active.

Brachet text, continued (French)

Herbst croit que les agents inorganiques qu'il a étudiés modifieraient le sexe en influençant l'activité respiratoire des larves : un taux d'oxydation élevé caractériserait la femelle. Il ne s'agit là que d'une hypothèse, qu'il serait aisé de vérifier expérimentalement : il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous des effets variés (trompe, extrait aqueux de trompe, agents minéraux). Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez *Bonellia*, de substances affectant spécifiquement la respiration : inhibiteurs comme le cyanure, l'oxyde de carbone, l'hydrogène sulfuré et activateurs tels que le dinitrophénol, le bleu de méthylène ou la pyocyanine. Il serait d'ailleurs sage, au cours de pareille étude, de contrôler les effets de ces substances par des mesures directes du métabolisme.

Cet exemple prouve combien nos connaissances en de tels domaines sont rudimentaires ; les expériences les plus simples, qui devraient servir de point de départ à une analyse plus poussée, n'ont pas encore été tentées et il est clair que l'étude biochimique du cas, cependant classique, de *Bonellia* n'en est qu'à ses premiers tâtonnements ; souhaitons donc que le métabolisme des larves de *Bonellia* soit l'objet de prochaines recherches.

Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves (5 %), nageant librement et ne se fixant pas sur la trompe, deviennent des mâles : sans doute s'agit-il d'individus dont la différenciation sexuelle est génotypique. On voit donc clairement que, dans le cas de *Bonellia*, le sexe résulterait d'une combinaison de facteurs génotypiques et phénotypiques avec prépondérance de ces derniers. Au point de vue chimique, nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle et provoquer l'apparition d'intersexués ou même le renversement du sexe ; rien n'autorise à considérer que ces substances exerceraient une action primaire sur les oxydations et, à l'heure présente, il faut tenir cette conception pour hypothétique.

BRA(F) S1: On sait que la femelle de ce Ver marin a l'aspect d'un sac de 7 à 8cm de long auquel fait suite une trompe atteignant près d'un mètre.

1. près de	D	ℓ_Q	On sait que la femelle de ce Ver marin a l'aspect d'un sac de 7 à 8 cm de long auquel fait suite une trompe atteignant un mètre
2. atteignant un mètre	Vant Ω_1	$\pi_{N\ 7}$ (trompe)	On sait que la femelle de ce Ver marin a l'aspect d'un sac de 7 à 8 cm de long auquel fait suite une trompe
3. auquel fait suite une trompe	QU tV Σ_1	$\pi_{N\ 6}$ (sac)	On sait que la femelle de ce Ver marin a l'aspect d'un sac de 7 à 8 cm de long
4. de long	de N_d	π_Q	On sait que la femelle de ce Ver marin a l'aspect d'un sac de 7 à 8 cm
5. à 8	à Q	π_Q	On sait que la femelle de ce Ver marin a l'aspect d'un sac de 7 cm
6. de 7 cm	de Q N_m	$\pi_{N\ 2}$ (sac)	On sait que la femelle de ce Ver marin a l'aspect d'un sac
7. d'un sac	P N	$\pi_{N\ 2}$ (aspect)	On sait que la femelle de ce Ver marin a un aspect ©
8. marin	A	$\pi_{N\ 3}$ (Ver)	On sait que la femelle de ce Ver a un aspect
9. de ce Ver	P N	$\pi_{N\ 2}$ (femelle)	On sait que la femelle a un aspect.

$=C_1= \Sigma_1$ tV Ω_6

où Ω_6=que C_1=que Σ_1 tV Ω_1

BRA(F) S2: Le mâle ne mesure qu'un à deux millimètres et vit en parasite dans l'intestin ou l'utérus de la femelle.

1. de la femelle	P N	$\eta_{N\ 2}$ (utérus)	Le mâle ne mesure qu'un à deux millimètres et vit en parasite dans l'intestin ou l'utérus
2. ou l'utérus	C_c N	$\eta_{x\ 1}$ x=N(intestin)	Le mâle ne mesure qu'un à deux millimètres et vit en parasite dans l'intestin
3. dans l'intestin	P N	$a_{C\ 3}$	Le mâle ne mesure qu'un à deux millimètres et vit en parasite
4. en parasite	P N	$a_{V\ 1}$	Le mâle ne mesure qu'un à deux millimètres et vit
5. et vit	$C_c(\Sigma)$tV Ω	$\eta_{x\ 1}$ $x = C_1$	Le mâle ne mesure qu'un à deux millimètres
6. à deux	à Q	η_Q	Le mâle ne mesure qu'un millimètre ⓑ
7. ne...que	D_n	$a_{C\ 1}$	Le mâle mesure un millimètre. $=C_1 = \Sigma_1$ tV Ω_1

BRA(F) S3A: Les oeufs fécondés donnent naissance à des larves nageantes qui ne tardent pas à se fixer sur un substratum solide;

1. solide	A	$\eta_{N\ 3}$ (substratum)	Les oeufs fécondés donnent naissance à des larves nageantes qui ne tardent pas à se fixer sur un substratum
2. ne...pas	D_n	$a_{C\ 1}$	Les oeufs fécondés donnent naissance à des larves nageantes qui tardent à se fixer sur un substratum
3. qui tardent à se fixer sur un substratum	QU C_1	$\eta_{N\ 6}$ (larves)	Les oeufs fécondés donnent naissance à des larves nageantes
4. nageantes	A	$\eta_{N\ 3}$ (larves)	Les oeufs fécondés donnent naissance à des larves
5. fécondés	Vé	$\eta_{N\ 4}$ (oeufs)	Les oeufs donnent naissance à des larves; $=C_1 = \Sigma_1$ tV Ω_2

BRA(F) S3B: avant ce moment, la différenciation sexuelle n'est pas encore établie (Baltzer);

1. (Baltzer)	M N	$\eta_{x\ 1}$ $x=C_1$	Avant ce moment, la différenciation sexuelle n'est pas encore établie
2. encore	D	$a_{V\ 2}$	Avant ce moment, la différenciation sexuelle n'est pas établie
3. n'...pas	D_n	$a_{C\ 1}$	Avant ce moment, la différenciation sexuelle est établie
4. sexuelle	A	$h_{N\ 3}$ (différenciation)	Avant ce moment, une différenciation @ est établie
5. avant ce moment,	P N	$a_{C\ 3}$	Une différenciation est établie; $=C_1=\Sigma_1\ tV\ \Omega_{\text{être}\ 9}$

BRA(F) S3C: si ces larves se fixent sur un support quelconque, elles deviennent des femelles;

1. quelconque	A	$h_{N\ 3}$ (support)	Si ces larves se fixent sur un support, elles deviennent des femelles
2. si ces larves se fixent sur un support,	$C_s\ C_1$	$a_{C\ 4}$	Elles deviennent des femelles; $=C_1=\Sigma_1\ tV\ \Omega_4$

BRA(F) S3D: mais si elles se posent sur la trompe de la femelle, elles deviennent des mâles.

1. de la femelle	P N	$h_{N\ 2}$ (trompe)	mais si elles se posent sur la trompe, elles deviennent des mâles
2. si elles se posent sur la trompe,	$C_s\ C_1$	$a_{C\ 4}$	Mais elles deviennent des mâles. $=C_c\ C_1=\Sigma_1\ tV\ \Omega_4$

BRA(F) S4A: Lorsqu'on immerge des larves dans de l'eau de mer contenant un fragment de la trompe, un grand nombre d'entre elles se transforment en "intersexuées",
S4B: c'est-à-dire qu'elles présentent des caractères intermédiaires entre le mâle et la femelle.

S4A			
1. grand	A	$\ell_{N\ 1}$ (nombre)	Lorsqu'on immerge des larves dans de l'eau de mer contenant un fragment de la trompe, un nombre d'entre elles se transforment en "intersexuées"
2. un nombre d'entre	N P	$\ell_{N\ 2}$ (elles)	Lorsqu'on immerge des larves dans de l'eau de mer contenant un fragment de la trompe, elles se transforment en "intersexuées"
3. de la trompe	P N	$h_{N\ 2}$ (fragment)	Lorsqu'on immerge des larves dans de l'eau de mer contenant un fragment, elles se transforment en "intersexuées"
4. contenant un fragment	Vant Ω_1	$h_{N\ 7}$ (fragment)	Lorsqu'on immerge des larves dans de l'eau de mer, elles se transforment en "intersexuées"
5. de mer	P N	$h_{N\ 2}$ (eau)	Lorsqu'on immerge des larves dans de l'eau, elles se transforment en "intersexuées"
6. dans de l'eau	P N	$a_{C\ 3}$	Lorsqu'on immerge des larves, elles se transforment en"intersexuées"
7. lorsqu'on immerge des larves,	$C_s\ C_1$	$a_{C\ 4}$	Elles se transforment en "intersexuées", $=C_1= \Sigma_1\ tV\ \Omega_3$
S4B			
1. intermédiaires entre le mâle et la femelle	A P N	$h_{N\ 3}$ (caractères)	C'est-à-dire qu'elles présentent des caractères
2. c'est-à-dire qu'elles présentent des caractères	M C_1	$h_{x\ 1}$ $x=C_1$	S4A

BRA(F) S5A1: Ces intéressantes constatations portent à penser que la trompe de la femelle exercerait une influence masculinisante sur les larves nageantes, encore indifférenciées:

1. encore	D	ℓ_A	Ces intéressantes constatations portent à penser que la trompe de la femelle exercerait une influence masculinisante sur les larves nageantes, indifférenciées
2., indifférenciées	A	$a_{N\ 1}$	Ces intéressantes constatations portent à penser que la trompe de la femelle exercerait une influence masculinisante sur les larves nageantes
3. nageantes	A	$h_{N\ 3}$ (larves)	Ces intéressantes constatations portent à penser que la trompe de la femelle exercerait une influence masculinisante sur les larves
4. sur les larves	P N	$h_{N\ 2}$ (influence)	Ces intéressantes constatations portent à penser que la trompe de la femelle exercerait une influence masculinisante
5. masculinisante	A	$h_{N\ 3}$ (influence)	Ces intéressantes constatations portent à penser que la trompe de la femelle exercerait une influence
6. de la femelle	P N	$h_{N\ 2}$ (trompe)	Ces intéressantes constatations portent à penser que la trompe exercerait une influence
7. intéressantes	A	$\ell_{N\ 1}$ (constatations)	Ces constatations portent à penser que la trompe exercerait une influence

$=C_1 = \Sigma_1\ tV\ \Omega_{10}$

où Ω_{10}=à V Ω_6 où Ω_6= que C_1

BRA (F) S5A2 :effectivement, Baltzer a observé que des extraits aqueux de la trompe sont masculinisants;

1. de la trompe	P N	$h_{N\ 2}$ (extraits)	:Effectivement, Baltzer a observé que des extraits aqueux sont masculinisants
2. aqueux	A	$h_{N\ 3}$ (extraits)	:Effectivement, Baltzer a observé que des extraits sont masculinisants
3. effectivement,	D	$a_{C\ 1}$	:Baltzer a observé que des extraits sont masculinisants
4. :Baltzer a observé que des extraits sont masculinisants;	M C_1	$h_{x\ 1}$ $x=C_1$	S541

BRA(F) S5B: le facteur actif résiste à l'ébullition et à de grosses variations du pH;

1. du pH	P N	$h_{N\ 2}$ (variations)	Le facteur actif résiste à l'ébullition et à de grosses variations
2. grosses	A	$l_{N\ 1}$ (variations)	Le facteur actif résiste à l'ébullition et à des variations ⓔ
3. et à des variations	C_c P N	$h_{x\ 1}$ $x=P\ N(\Omega_2)$	Le facteur actif résiste à l'ébullition
4. actif	A	$h_{N\ 3}$ (facteur)	Un facteur ⓒ résiste à l'ébullition; $=C_1=\Sigma_1\ tV\ \Omega_2$

BRA(F) S5C1: les extraits à l'acétone sont au contraire inactifs (Nowinski)
S5C2: et il semblerait donc que la trompe renferme un "facteur hormonal" hydrosoluble.

S5C1			
1.(Nowinski)	M N	$\hbar_{x\ 1}$ $x=c_1$	Les extraits à l'acétone sont au contraire inactifs
2. au contraire	D	$a_{C\ 1}$	Les extraits à l'acétone sont inactifs
3. à l'acétone	P N	$\hbar_{N\ 2}$ (extraits)	Les extraits sont inactifs $=C_1=\Sigma_1\ tV\ \Omega_{\text{être } 3}$
S5C2			
1. hydrosoluble	A	$\hbar_{N\ 3}$ (facteur hormonal)	Et il semblerait donc que la trompe renferme un "facteur hormonal"
2. donc	D_s	$a_{C\ 1}$	Et il semblerait que la trompe renferme un "facteur hormonal"
3. et il semblerait que la trompe renferme un "facteur hormonal"	$C_c\ C_6$	$\hbar_{x\ 1}$ $x=C_1$	S5C1

BRA (F) S6 : Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents très simples, tels que les acides chlorhydrique et carbonique, des traces de cuivre, le magnésium, le potassium.

1. ,le potassium	M N	$h_{x\ 1}$ x=N	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents très simples, tels que les acides chlorhydrique et carbonique, des traces de cuivre, le magnésium
2. ,le magnésium	M N	$h_{x\ 1}$ x=N	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents très simples, tels que les acides chlorhydrique et carbonique, des traces de cuivre
3. ,des traces de cuivre	M N	$h_{x\ 1}$ x=N	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents très simples, tels que les acides chlorhydrique et carbonique
4. et carbonique	C_c A	$h_{x\ 1}$ x=A(dans.5	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents très simples, tels que l'acide ⓓ chlorhydrique
5. ,tels que l'acide chlorhydrique	P N	$h_{N\ 2}$ (agents)	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents très simples
6. très	D	l_A (simples)	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents simples
7. simples	A	$h_{N\ 3}$ (agents)	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par addition d'agents
8. d'agents	P N	$h_{N\ 2}$ (addition)	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi par une addition ⓒ

BRA(F) S6 (suite)

9. par une addition	P N	$a_{C\ 3}$	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir aussi
10. aussi	D	$a_{C\ 1}$	Toutefois Herbst a montré que le virage vers le sexe masculin des larves nageantes peut s'obtenir
11. nageantes	A	$h_{N\ 3}$ (larves)	Toutefois Herbst a montré que le virage vers le sexe masculin des larves peut s'obtenir
12. des larves	P N	$h_{N\ 2}$ (virage)	Toutefois Herbst a montré que le virage vers le sexe masculin peut s'obtenir
13. masculin	A	$h_{N\ 3}$ (sexe)	Toutefois Herbst a montré que le virage vers un sexe ⓒ peut s'obtenir
14. vers un sexe	P N	$h_{N\ 2}$ (virage)	Toutefois Herbst a montré qu'un virage ⓒ peut s'obtenir
15. toutefois	D_s	$a_{C\ 1}$	Herbst a montré qu'un virage peut s'obtenir.

$=C_1= \Sigma_1$ tV $\Omega_{\text{avoir 1}}$

où $\Omega_{\text{avoir 1}}$=Vé Ω_6; Ω_6=que C_1

BRA (F) S7: La masculinisation est donc réalisable expérimentalement par des agents variés.

1. variés	A	$\hbar_{N\ 3}$ (agents)	La masculinisation est donc réalisable expérimentalement par des agents
2. par des agents	P N	$a_{C\ 3}$	La masculinisation est donc réalisable expérimentalement
3. expérimentalement	D	$a_{C\ 1}$	La masculinisation est donc réalisable
4. donc	D_s	$a_{C\ 1}$	La masculinisation est réalisable

$$=C_1=\Sigma_1\ tV\ \Omega_{\text{être }3}$$

BRA(F) S8: Il est vraisemblable que la substance encore inconnue, présente dans la trompe, est la seule physiologiquement active.

1. physiologiquement	D	ℓ_A	Il est vraisemblable que la substance encore inconnue, présente dans la trompe, est la seule active
2. active	A	$\hbar_{N\ 3}$ ($\overset{\circ}{N}$)	Il est vraisemblable que la substance encore inconnue, présente dans la trompe, est la seule N
3. dans la trompe	P N	$\hbar_{A\ 1}$ (présente)	Il est vraisemblable que la substance encore inconnue, présente, est la seule N
4. ,présente,	M A	$\hbar_{x\ 1}$ x=A	Il est vraisemblable que la substance encore inconnue est la seule N
5. encore	D	ℓ_A	Il est vraisemblable que la substance inconnue est la seule N
6. inconnue	A	$\hbar_{N\ 3}$ (substance)	Il est vraisemblable que la substance est la seule N .

$$=C_7=\Sigma_s\ tV_{\text{être}}\ A_s\ \Omega_s$$

où Σ_s=que C_1; $C_1=\Sigma_1\ tV\ \Omega_{\text{êtrel}}$

BRA(F) S9A1: Herbst croit que les agents inorganiques qu'il a étudiés modifieraient le sexe en influençant l'activité respiratoire des larves

S9A2 : un taux d'oxydation élevé caractériserait la femelle.

S9A1

1. des larves	P N	$h_{N\ 2}$ (activité)	Herbst croit que les agents inorganiques qu'il a étudiés modifieraient le sexe en influençant l'activité respiratoire
2. respiratoire	A	$h_{N\ 3}$ (activité)	Herbst croit que les agents inorganiques qu'il a étudiés modifieraient le sexe en influençant une activité ©
3. en influençant une activité	en Vant Ω_1	$a_{C\ 6}$	Herbst croit que les agents inorganiques qu'il a étudiés modifieraient le sexe
4. qu'il a étudiés	QU C_1^{-N}	$h_{N\ 6}$ (agents)	Herbst croit que les agents inorganiques modifieraient le sexe
5. inorganiques	A	$h_{N\ 3}$ (agents)	Herbst croit que des agents © modifieraient le sexe

$=C_1= \Sigma_1$ tV Ω_6

S9A2

1. élevé	Vé	$h_{N\ 4}$ (taux)	:Un taux d'oxydation caractériserait la femelle
2. d'oxydation	P N	$h_{N\ 2}$ (taux)	:Un taux caractériserait la femelle
3. :un taux caractériserait la femelle	M C_1	$h_{x\ 1}$ $x=C_1$	S9A1

BRA(F) S10A: Il ne s'agit là que d'une hypothèse, qu'il serait aisé de vérifier expérimentalement

1. expérimentalement	D	$a_{C\ 1}$	Il ne s'agit là que d'une hypothèse, qu'il serait aisé de vérifier
2.,qu'il serait aisé de vérifier	QU C_1^{-N}	$h_{N\ 6}$ (hypothèse)	Il ne s'agit là que d'une hypothèse
3. ne...que	D_n	$a_{C\ 1}$	Il s'agit là d'une hypothèse
4. là	D	$a_{C\ 1}$	Il s'agit d'une hypothèse

$=C_6=$ il tV_{il} Ω_1

BRA(F) S1OB :il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés (trompe, extrait aqueux de trompe, agents minéraux).

1. minéraux	A	$h_{N\ 3}$ (agents)	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés (trompe, extrait aqueux de trompe, agents)
2. ,agents	M N	$h_{x\ 1}$ x=N	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés (trompe, extrait aqueux de trompe)
3. de trompe	P N	$h_{N\ 2}$ (extrait)	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés (trompe, extrait aqueux)
4. aqueux	A	$h_{N\ 3}$ (extrait)	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés (trompe, extrait)
5. ,extrait	M N (trompe)	$h_{x\ 1}$ x=N	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés (trompe)
6. (trompe)	M N (effets)	$h_{x\ 1}$ x=N	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous les effets variés
7. variés	A	$h_{N\ 3}$ (effets)	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient sous des effets ©

BRA(F) S10B

8. sous des effets	P N	$a_{C\ 3}$	Il y aurait intérêt à savoir si l'intensité de la respiration change au moment où les sexes se différencient
9. au moment où les sexes se différencient	$C_s\ C_1$	$a_{C\ 4}$	Il y aurait intérêt à savoir si l'intensité de la respiration change
10. de la respiration	P N	$h_{N\ 2}$ (intensité)	Il y aurait intérêt à savoir si l'intensité change
11. à savoir si l'intensité change	à V Ω_{16}	$h_{N\ 10}$ (intérêt)	Il y aurait un intérêt. ©
12. :il y aurait un intérêt	M C_6	$h_{x\ 1}$ $x=C_6$	S10A

BRA(F) S11: Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure, l'oxyde de carbone, l'hydrogène sulfuré et activateurs tels que le dinitrophénol, le bleu de méthylène ou la pyocyanine.

1. ou la pyocyanine	C_c N	$h_{x\ 1}$ $x=N$	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action,sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure, l'oxyde de carbone, l'hydrogène sulfuré et activateurs tels que le dinitophénol, le bleu de méthylène
2. ,le bleu de méthylène	M N	$h_{x\ 1}$ $x=N$(dinitrophénol)	Comme l'a suggéré Baltzer,il serait extêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure, l'oxyde de carbone, l'hydrogène sulfuré et activateurs tels que le dinitrophénol

BRA(F) S11			
3. tels que le dinitrophénol	P N	$h_{N\ 2}$ (activateurs)	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure, l'oxyde de carbone, l'hydrogène sulfuré et activateurs
4. et activateurs	C_c N	$h_{x\ 1}$ x=N(inhibiteurs)	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure, l'oxyde de carbone, l'hydrogène sulfuré
5. ,l'hydrogène sulfuré	M N	$h_{x\ 1}$ x=N	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure, l'oxyde de carbone
6. ,l'oxyde de carbone	M N	$h_{x\ 1}$ x=N(cyanure)	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs comme le cyanure
7. comme le cyanure	P N	$h_{N\ 2}$ (inhibiteurs)	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration: inhibiteurs
8.:inhibiteurs	M N	$h_{x\ 1}$ x=N(substances)	Comme l'a suggéré Baltzer,il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances affectant spécifiquement la respiration

BRA(F) S11

9. spécifiquement	D	$a_{V\ 2}$	Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel de Bonellia, de substances affectant la respiration
10. affectant la respiration	Vant Ω_1	$h_{N\ 7}$ (substances)	Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia, de substances
11. de substances	P N	$h_{N\ 2}$ (action)	Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel chez Bonellia
12. chez Bonellia	P N	$h_{N\ 2}$ (déterminisme)	Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher l'action, sur le déterminisme sexuel
13. sur le déterminisme sexuel	P N	$h_{N\ 2}$ (action)	Comme l'a suggéré Baltzer, il serait extrêmement utile de rechercher une action ©
14. extrêmement	D	l_A	Comme l'a suggéré Baltzer, il serait utile de rechercher une action
15. comme l'a suggéré Baltzer	C_s C_3	$a_{C\ 4}$	Il serait utile de rechercher une action.

$=C_7= \Sigma_s\ tV_{être} A_s\ \Omega_s$

où Ω_s = de V Ω_1

BRA(F) S12: Il serait d'ailleurs sage, au cours de pareille étude, de contrôler les effets de ces substances par des mesures directes du métabolisme.

1. du métabolisme	P N	$\eta_{N\ 2}$ (mesures)	Il serait d'ailleurs sage, au cours de pareille étude, de contrôler les effets de ces substances par des mesures directes
2. directes	A	$\eta_{N\ 3}$ (mesures)	Il serait d'ailleurs sage, au cours de pareille étude, de contrôler les effets de ces substances par des mesures
3. par des mesures	P N	$a_{C\ 3}$	Il serait d'ailleurs sage, au cours de pareille étude, de contrôler les effets de ces substances
4. de ces substances	P N	$\eta_{N\ 2}$ (effets)	Il serait d'ailleurs sage, au cours de pareille étude, de contrôler les effets
5. pareille	A	$\ell_{N\ 1}$ (étude)	Il serait d'ailleurs sage, au cours d'une étude ⓔ , de contrôler les effets
6.,au cours d'une étude,	P N	$a_{C\ 3}$	Il serait d'ailleurs sage de contrôler les effets
7. d'ailleurs	D	$a_{C\ 1}$	Il serait sage de contrôler les effets.

$$=C_7= \Sigma_s\ tV_{\text{être}}\ A_s\ \Omega_s$$

où Ω_s=de V Ω_1

BRA (F) S13A: Cet exemple prouve combien nos connaissances en de tels domaines sont rudimentaires;

1. en de tels domaines	P N	$a_{C\ 3}$	Cet exemple prouve combien nos connaissances sont rudimentaires; $=C_1= \Sigma_1\ tV\ \Omega_{16}$ où $\Omega_{16}=QU_{int}\ C_1$

BRA (F) S13B1: les expériences les plus simples, qui devraient servir de point de départ à une analyse plus poussée, n'ont pas encore été tentées

BRA (F) S13B2 et il est clair que l'étude biochimique du cas, cependant classique, de Bonellia n'en est qu'à ses premiers tâtonnements;

S13B1			
1. encore	D	$a_{V\ 2}$	Les expériences les plus simples, qui devraient servir de point de départ à une analyse plus poussée, n'ont pas été tentées
2. n'...pas	D_n	$a_{C\ 1}$	Les expériences les plus simples, qui devraient servir de point de départ à une analyse plus poussée, ont été tentées
3. plus	D	$a_{Vé}$	Les expériences les plus simples, qui devraient servir de point de départ à une analyse poussée, ont été tentées
4. poussée	Vé	$h_{N\ 4}$ (analyse)	Les expériences les plus simples, qui devraient servir de point de départ à une analyse ont été tentées
5. à une analyse	P N	$h_{N\ 2}$ (point de départ)	Les expériences les plus simples, qui devraient servir de point de départ, ont été tentées
6. ,qui devraient servir de point de départ,	$QU\ C_1^{-N}$	$h_{N\ 6}$ (expériences)	Les expériences les plus simples ont été tentées
7. les...(des° N)	le...(des° N)	l_{D_p}	Des expériences © plus simples ont été tentées
8. plus	D_p	l_A (simples)	Des expériences simples ont été tentées
9. simples	A	$h_{N\ 3}$ (expériences)	Des expériences ont été tentées $=C_1 =\Sigma_1\ tV\ \Omega_{avoir\ 1}$

BRA (F)
S13B2

1. premiers	A	$\ell_{N\ 1}$ (tâtonnements)	Et il est clair que l'étude biochimique du cas, cependant classique, de Bonellia n'en est qu'à ses tâtonnements
2. n'...que	D_n	$a_{C\ 1}$	Et il est clair que l'étude biochimique du cas, cependant classique, de Bonellia en est à ses tâtonnements
3. de Bonellia	P N	$h_{N\ 2}$ (cas)	Et il est clair que l'étude biochimique du cas, cependant classique, en est à ses tâtonnements
4. cependant	D_s	ℓ_A	Et il est clair que l'étude biochimique du cas, classique, en est à ses tâtonnements
5.,classique,	A	$a_{N\ 1}$	Et il est clair que l'étude biochimique du cas en est à ses tâtonnements
6. du cas	P N	$h_{N\ 2}$ (étude)	Et il est clair que l'étude biochimique en est à ses tâtonnements
7. biochimique	A	$h_{N\ 3}$ (étude)	Et il est clair que l'étude en est à ses tâtonnements
8. et il est clair que l'étude en est à ses tâtonnements;	$C_c\ C_7$	$h_{x\ 1}$ $x=C_1$	S13B1

BRA (F) S13C: souhaitons donc que le métabolisme des larves de Bonellia soit l'objet de prochaines recherches.

1. prochaines	A	$\ell_{N\ 1}$ (recherches)	Souhaitons donc que le métabolisme des larves de Bonellia soit l'objet de recherches
2. de recherches	P N	$h_{N\ 2}$ (objet)	Souhaitons donc que le métabolisme des larves de Bonellia soit un objet (c)
3. de Bonellia	P N	$h_{N\ 2}$ (larves)	Souhaitons donc que le métabolisme des larves soit un objet
4. des larves	P N	$h_{N\ 2}$ (métabolisme)	Souhaitons donc que le métabolisme soit un objet
5. donc	D_s	$a_{C\ 1}$	Souhaitons que le métabolisme soit un objet.

$= C_9 = \iota\vee\ \Omega_6$

BRA(F) S14A: Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves (5%), nageant librement et ne se fixant pas sur la trompe, deviennent des mâles

1. ne...pas	D_n	$a_{C\ 1}$	Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves (5%), nageant librement et se fixant sur la trompe, deviennent des mâles
2. et se fixant sur la trompe	C_c Vant Ω_3	$h_{x\ 1}$ x=Vant Ω (.4)	Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves (5%), nageant librement, deviennent des mâles
3. librement	D	$a_{V\ 2}$	Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves, nageant, deviennent des mâles
4. ,nageant,	Vant Ω_o	$a_{C\ 7}$	Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves (5%) deviennent des mâles
5. (5%)	M Q	$h_{x\ 1}$ x=N(nombre)	Il ne faut pas omettre de signaler que, d'après Baltzer, un petit nombre de larves deviennent des mâles
6. petit	A	$\ell_{N\ 1}$ (nombre)	Il ne faut pas omettre de signaler que, d'après Baltzer, un nombre de larves deviennent des mâles
7. un nombre de	N de	$\ell_{N\ 2}$ (larves)	Il ne faut pas omettre de signaler que, d'après Baltzer, des larves © deviennent des mâles
8. ,d'après Baltzer,	P N	$a_{C\ 3}$	Il ne faut pas omettre de signaler que des larves deviennent des mâles
9. ne...pas	D_n	$a_{C\ 1}$	Il faut omettre de signaler que des larves deviennent des mâles.

$=C_6=$ il tV_{il} Ω_9

où Ω_9=de V Ω_6; Ω_6=que C_1

où $C_1=\Sigma_1$ tV Ω_4

BRA(F) S143: sans doute s'agit-il d'individus dont la différenciation sexuelle est génotypique.

1. sexuelle	A	$\mathcal{R}_{N\ 3}$ (différenciation)	Sans doute s'agit-il d'individus dont la différenciation est génotypique
2. dont la différenciation est génotypique	QU C_1	$\mathcal{R}_{N\ 6}$ individus)	Sans doute s'agit-il d'individus
3. sans doute	D_s	$\mathcal{a}_{C\ 1}$	S'agit-il d'individus. $=C_6$(inverti)=se tV_{il}-il Ω_1
4. :s'agit-il d'individus	M C_6	$r_{x\ 1}$ x=C_6	S14A

BRA(F) S15: On voit donc clairement que, dans le cas de Bonellia, le sexe résulterait d'une combinaison de facteurs génotypiques et phénotypiques avec prépondérance de ces derniers.

1. de ces derniers	P N	$h_{N\ 2}$ (prépondérance)	On voit donc clairement que, dans le cas de Bonellia, le sexe résulterait d'une combinaison de facteurs génotypiques et phénotypiques avec une prépondérance ©
2. avec une prépondérance	P N	$a_{C\ 3}$	On voit donc clairement que, dans le cas de Bonellia, le sexe résulterait d'une combinaison de facteurs génotypiques et phénotypiques
3. et phénotypiques (+ une combinaison de)	C_c A (+ N de)	$h_{x\ 1}$ x=A	On voit donc clairement que, dans le cas de Bonellia, le sexe résulterait de facteurs génotypiques
4. génotypiques	A	$h_{N\ 3}$ (facteurs)	On voit donc clairement que, dans le cas de Bonellia, le sexe résulterait de facteurs
5. de Bonellia	P N	$h_{N\ 2}$ (cas)	On voit donc clairement que, dans un cas © , le sexe résulterait de facteurs
6.,dans un cas,	P N	$a_{C\ 3}$	On voit donc clairement que le sexe résulterait de facteurs
7. clairement	D	$a_{V\ 2}$	On voit donc que le sexe résulterait de facteurs
8. donc	D_s	$a_{C\ 1}$	On voit que le sexe résulterait de facteurs.

$=C_1= \Sigma_1$ tV Ω_6

BRA(F) S16A : Au point de vue chimique, nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle et provoquer l'apparition d'intersexués ou même le renversement du sexe;

1. du sexe	P N	$h_{N\ 2}$ (renversement)	Au point de vue chimique, nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle et provoquer l'apparition d'intersexués ou même un renversement ©
2. même	D	$a_{C\ 1}$	Au point de vue chimique, nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle et provoquer l'apparition d'intersexués ou un renversement
3. ou un renversement	C_c N	$h_{x\ 1}$ x=N (apparition)	Au point de vue chimique, nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle et provoquer l'apparition d'intersexués
4. d'intersexués	P N	$h_{N\ 2}$ (apparition)	Au point de vue chimique nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle et provoquer une apparition ©
5. et provoquer une apparition	C_c V 1	$h_{x\ 1}$ x= VΩ (Ω_9 dans Ω_6)	Au point de vue chimique nous retiendrons que des agents très divers peuvent influencer la détermination sexuelle
6. sexuelle	A	$h_{N\ 3}$ (détermination)	Au point de vue chimique nous retiendrons que des agents très divers peuvent influencer une détermination ©
7. très	D	l_A (divers)	Au point de vue chimique nous retiendrons que des agents divers peuvent influencer une détermination
8. divers	A	$h_{N\ ?}$ (agents)	Au point de vue chimique nous retiendrons que des agents peuvent influencer une détermination
9. au point de vue chimique,	P N	$a_{C\ 3}$	Nous retiendons que des agents peuvent influencer une apparition; =C_1 =Σ_1 tV Ω_6

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B2A(F) S16B1: rien n'autorise à considérer que ces substances exercraient une action primaire sur les oxydations
B2A(F) S16B2: et, à l'heure présente, il faut tenir cette conception pour hypothétique.

1. sur les oxydations	P N	$\mathcal{R}_{N\ 2}$ (action)	Rien n'autorise à considérer que ces substances exerceraient une action primaire
2. primaire	A	$\mathcal{R}_{N\ 3}$ (action)	Rien n'autorise à considérer que ces substances exerceraient une action

$$=C_1=\Sigma_1\ (ne)\ tV\ \Omega_{10}$$

où Ω_{10}=à V Ω_5

S16B2

1.,à l'heure présente,	P N	$\alpha_{C\ 3}$	Et il faut tenir cette conception pour hypothétique
2. et il faut tenir cette conception pour hypothétique.	$C_c\ C_6$	$\mathcal{R}_{x\ 1}$ x-C_1	S16B1

BRA(F) S1

où sait que la femelle a un aspect.
- de ce (9) Ver (Σ_2) — marin (8)
- d'un (7) sac (Ω) — de (6) 4 cm — à (5) 8
- d'un (7) sac (Ω) — de (6) 4 cm — de long (4)
- d'un (7) sac (Ω) — auquel fait suite une trompe (3) — atteignant un mètre (Σ) (2) — près de (1)

BRA(F) S2

Le mâle mesure un millimètre.
- ne (7) ... que
- à (6) deux (Ω)
- et (5) vit — en (4) parasite
- et (5) vit — dans (3) l'intestin — ou (2) l'utérus — de (1) la femelle

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BRA(F) S3A

Les oeufs donnent naissance à des larves;
- fécondés (Σ) (5)
- nageantes (Ω) (4)
- qui tardent à se fixer sur un substratum (Ω) (3) — ne (2) ... pas
- qui tardent à se fixer sur un substratum (Ω) (3) — solide (Ω) (1)

BRA(F)S3B

Une différentiation est établie;
- avant ce moment, (préΣ) 5
- sexuelle (Σ) 4
- n'... pas — encore 3 2
- (Baltzer) 1

BRA(F)S3C

Elles deviennent des femelles; — si ces larves se fixent sur un support, (préΣ) 2 — quelconque (Ω) 1

BRA(F)S3D

mais elles deviennent des mâles. — si elles se posent sur la trompe, (préΣ) 2 — de la femelle (Ω) 1

BRA(F)S4A

Elles se transforment en "intersexuées",
- lorsqu'on immerge des larves, (préΣ) 4 — dans de l'eau 6
  - de mer 5
  - contenant un fragment 4 — de la trompe (Ω) 3
- un nombre d'entre (Σ) 3 — grand 1

BRA(F)S4B

C'est à dire qu'elles présentent des caractères. 2 — intermédiaires entre le mâle et la femelle (Ω) 1.

BRA(F)S5A1

Ces constations portent à penser que la trompe exercerait une influence
- intéressantes (Σ1) [7]
- de la femelle (Σ2) [6]
- masculinisante (Ω2) [5]
- sur les larves (Ω2) [4]
  - nageantes [3]
  - indifférenciées [2] — encore

BRA(F)S5A2

: Baltzer a observé que des extraits sont masculinisants; [4]
- effectivement, (préΣ1) [3]
- aqueux (Σ2) [2]
- de la trompe (Σ2) [1]

BRA(F)S5B

un facteur résité à l'ébullition;
- actif (Σ) [4]
- et à [3] des variations (Ω)
  - grosses [2]
  - du pH [1]

BRA(F)S5C1

Les extraits sont inactifs
- à l'acétone (Σ) [3]
- au contraire (post V) [2]
- (Nowinski) [1]

BRA(F)S5C2

et il semblerait que la trompe renferme un "facteur hormonal". [3]
- donc (post V_1) [2]
- hydrosoluble (Ω_2) [1]

BRA(F)S6

Herbst a montré qu'un virage peut s'obtenir. [9]
- toutefois (pré Σ_1) [15]
- vers un sexe (Σ_2) [14] — masculin [13]
- des larves (Σ_e) [12] — nageantes [11]
- par une addition (Ω) [9]
  - aussi (pré P) [10]
  - d'agents [8] — simples [7] — très [6]
  - tels que l'acide chlorhydrique [5]
    - et carbonique (A) [4]
    - des traces de cuivre [3]
    - le magnésium [2]
    - le potassium [1]

BRA(F) S7

La masculinisation est réalisable.
- donc (pré Ω) 4
- expérimentalement (post Ω) 3
- par des agents (post Ω) 2 — variés 1

BRA(F)S8

Il est vraisemblable qu'une substance est la seule (N̊).
- inconnue (z_2) 6 — encore 5
- présente 4 — dans la trompe 3
- active (post Ω) 2 — physiologiquement 1

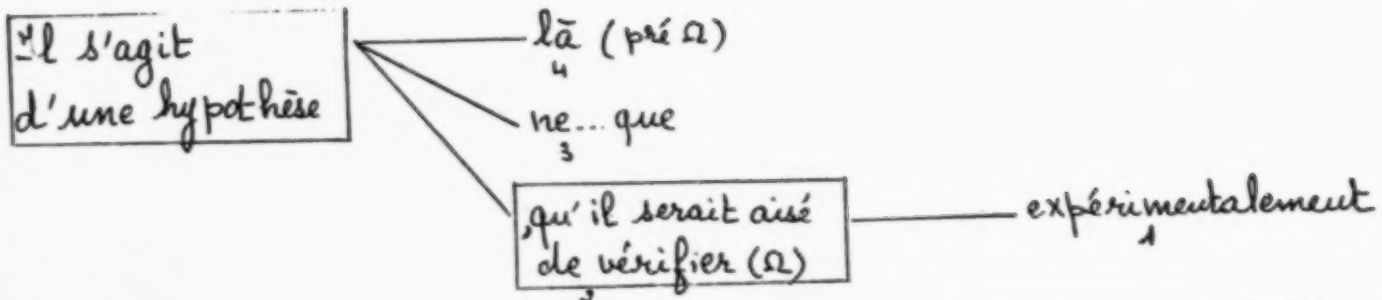
BRA(F)S9A1

Herbst croit que des agents modifieraient le sexe
- inorganiques (Σ_2) 5
- qu'il a étudiés (Σ_2) 4
- en influençant une activité 3
  - respiratoire (Ω) 2
  - des larves (Ω) 1

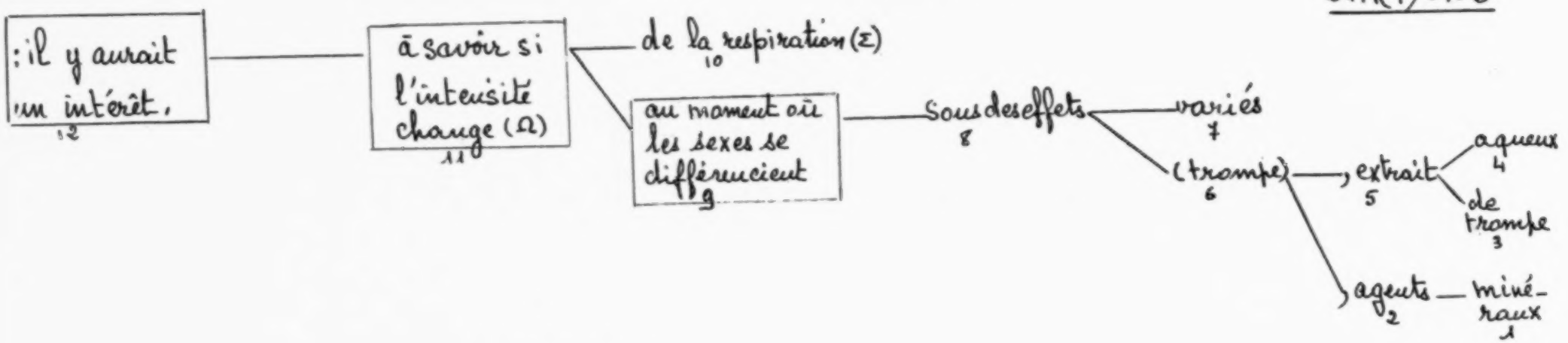
BRA(F)S9A2

: un taux caractériserait la femelle. 3
- d'oxydation (Σ) 2
- élevé (Σ) 1

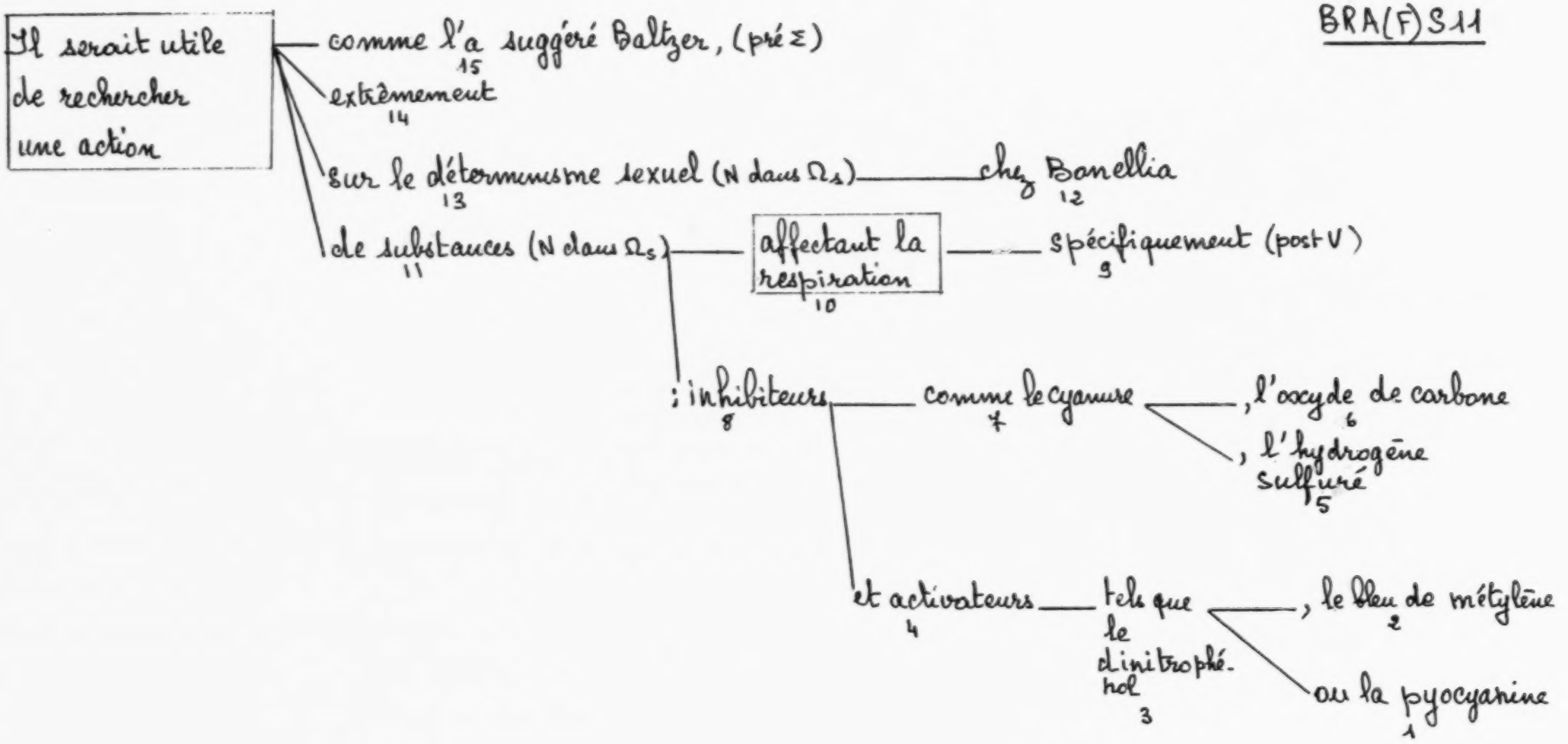
BRA(F)S10A



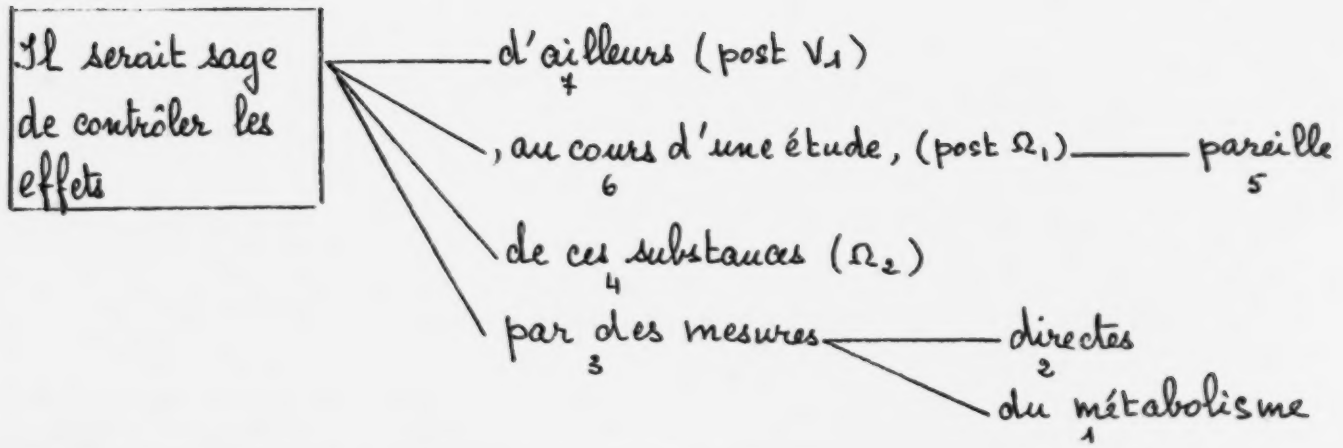
BPA(F)S10B



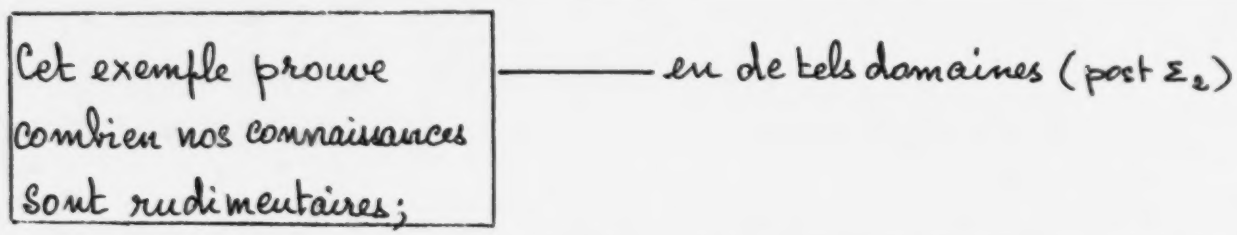
BRA(F)S11


Il serait utile de rechercher une action
comme l'a suggéré Baltzer, (préΣ) 15
extrêmement 14
sur le déterminisme sexuel (N dans Ω5) 13
chez Bonellia 12
de substances (N dans Ω5) 11
affectant la respiration 10
spécifiquement (postV) 9
; inhibiteurs 8
comme le cyanure 7
, l'oxyde de carbone 6
, l'hydrogène sulfuré 5
et activateurs 4
tels que le dinitrophénol 3
, le bleu de méthylène 2
ou la pyocyanine 1

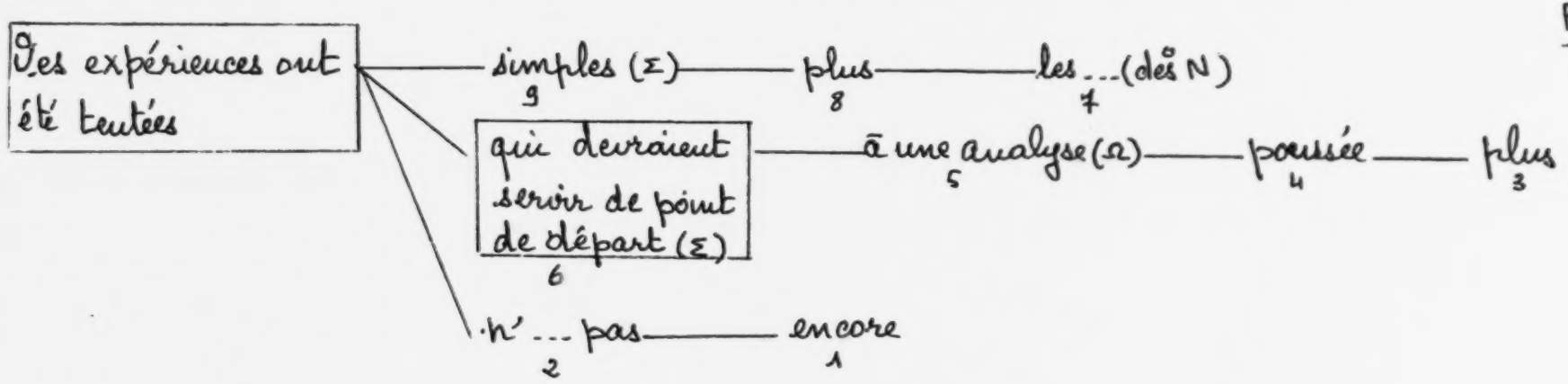
BRA(F)S12



BRA(F)S13A



BRA(F)S13B1



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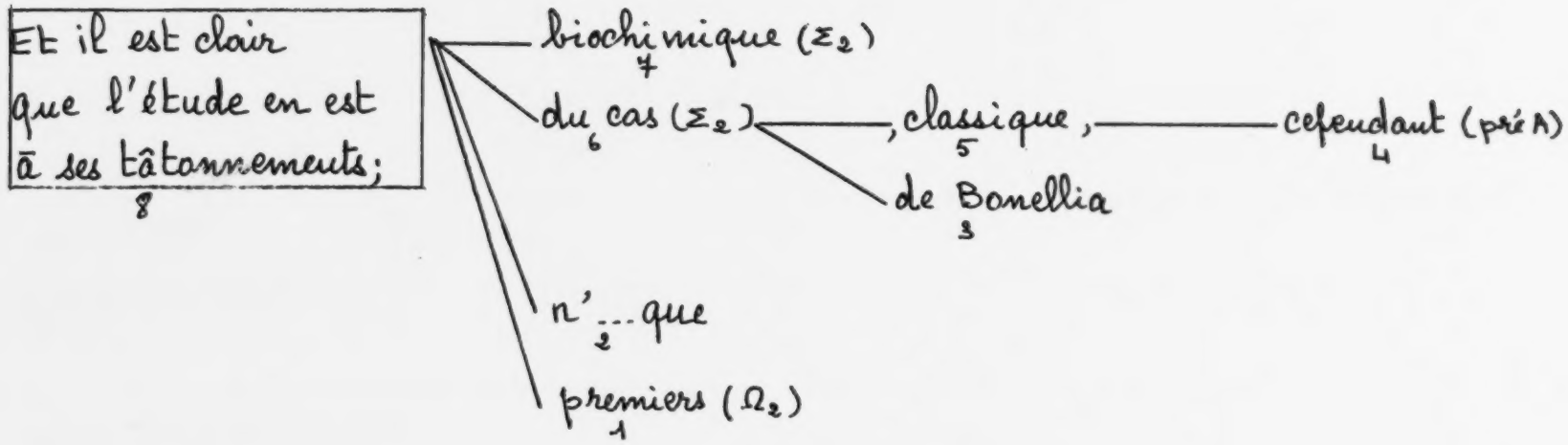
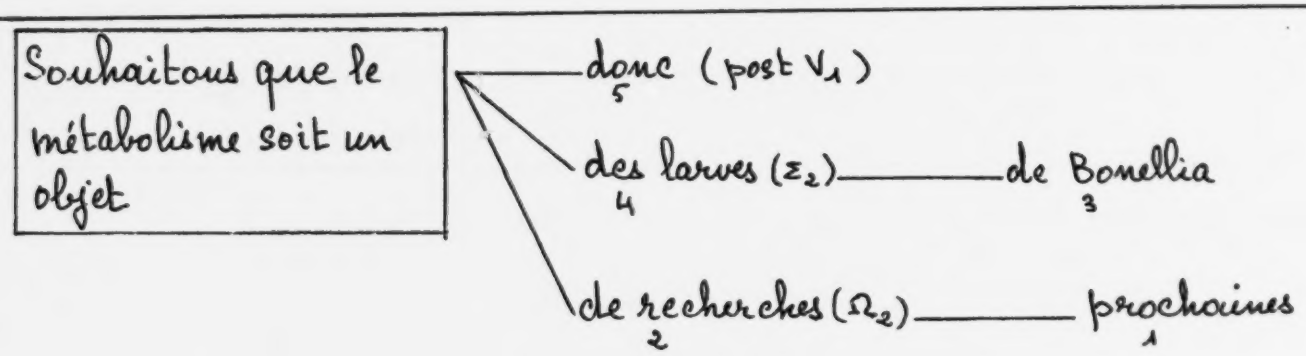
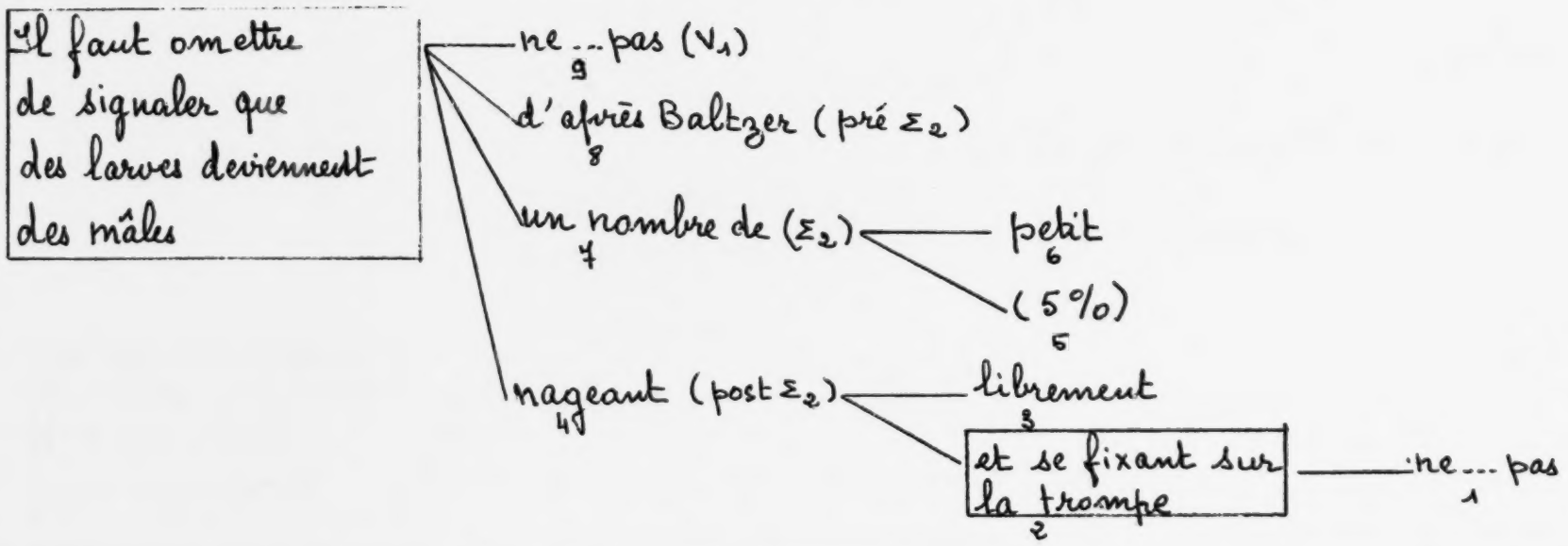


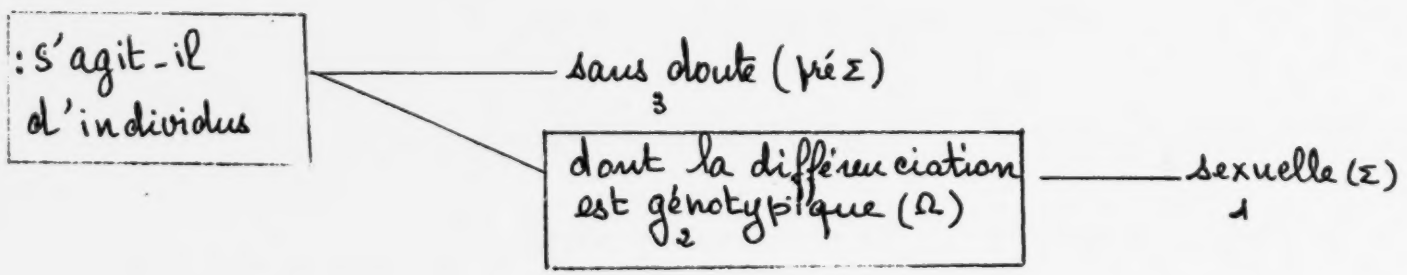
BRA(F)S13C



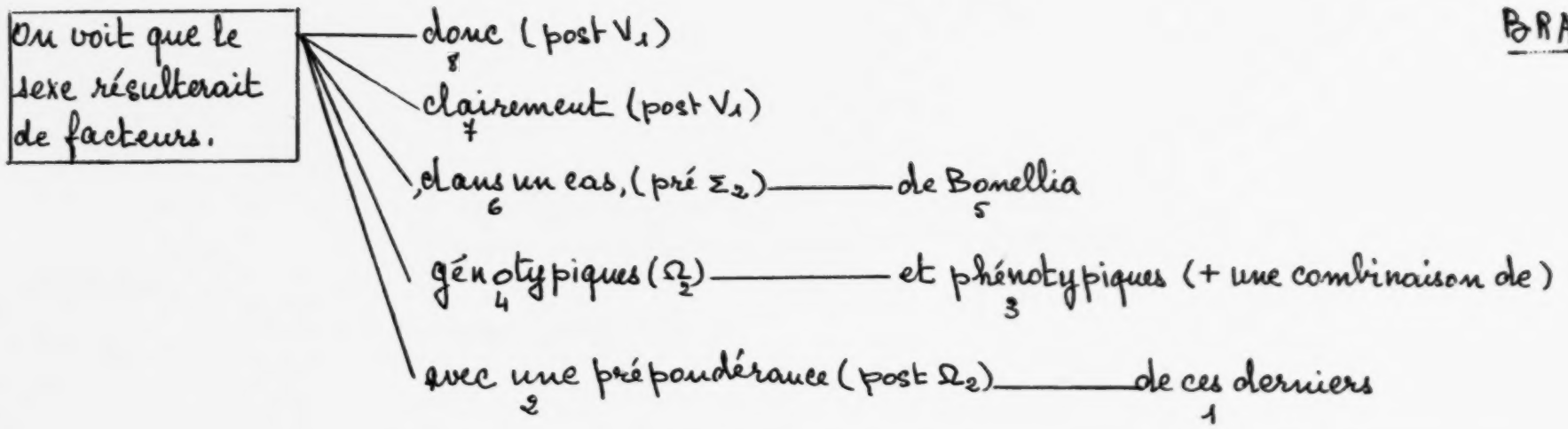
BRA(F)S14A



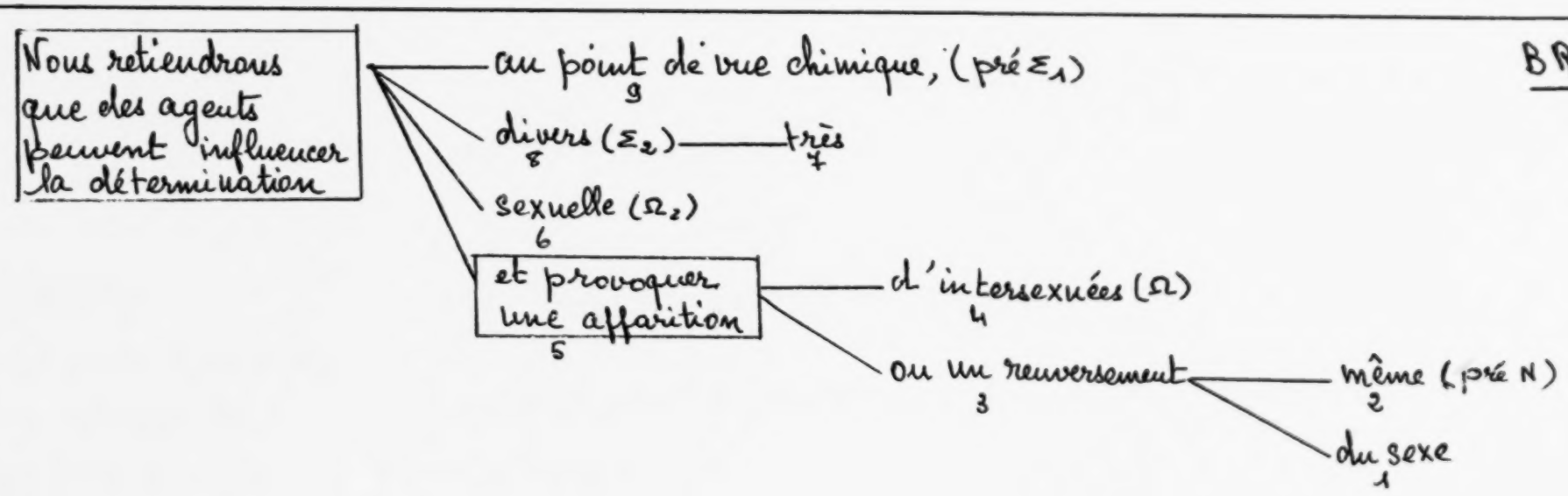
BRA(F)S14B



BRA(F) S15



BRA(F) S16A



Rien n'autorise à considérer que ces substances exerceraient une action

— primaire (Ω_2) (2)

— sur les oxydations (Ω_2) (1)

BRA(F)S16B1

BRA(F)S16B2

et il faut tenir cette conception pour hypothétique (2)

— , à l'heure présente, (préΣ.) (1)

II. Analysis of the English translation of the French text.

Brachet, Jean, Chemical Embryology. Translated from the French by Lester G. Barth. Interscience Publishers, Inc., New York, 1950, pp. 28-29.

II. Chemical Basis of Sex Determination

1. Case of Bonellia viridis

We know that the female of this marine worm has the structure 1
of a sac about 7 to 8 cm. long to which is attached a proboscis attain-
ing a length of almost a meter. The male measures only a few milli- 2
meters and lives as a parasite in the intestine or in the uterus of the
female. The fertilized eggs give rise to swimming larvae, which 3a
soon become attached to solid objects; before this, sexual differentia- 3b
tion is not yet established (Baltzer); if the larvae become attached 3c
to any ordinary support they develop into females, but if they fix 3d
themselves to the proboscis of a female they become males. When 4a
the larvae are placed in sea water containing a fragment of the pro-
boscis, a large number of them transform into "intersexes," that is, 4b
they show characters intermediate between male and female.

These interesting observations show that the proboscis of the 5
female exerts a masculinizing influence on swimming larvae which
are as yet undifferentiated. Baltzer has observed that aqueous ex- 6
tracts of the proboscis also have this masculinizing effect. The active 7a
substance is resistant to boiling and wide variations in pH, while
acetone extracts are on the contrary inactive (Nowinski); it would 7b
seem therefore that the proboscis contains a water soluble "hormonal
factor." However, Herbst has shown that the change of the swim- 8
ming larvae in a masculine direction can be obtained by the addition
of very simple reagents such as: hydrochloric acid, carbonic acid,
traces of copper, magnesium, potassium. Thus, masculinization can 9
be attained experimentally by a variety of agents. It is reasonable 10
that the substance, as yet unknown, in the proboscis is the only one
physiologically active.

Brachet text, continued (English)

Herbst believes that the inorganic agents which he has used 11
modify sex through an effect on the respiratory activity of the larvae,
a high respiratory rate being characteristic of the female. This is an 12a
hypothesis that would be easy to verify experimentally, and it would 12b
be interesting to know whether the intensity of respiration changes at
the time when the sexes differentiate under various influences (pro-
boscis, aqueous extract of proboscis, inorganic salts and acids). As 13
Baltzer suggested, it would be very useful to study the action on the
sex determination of *Bonellia*, of various substances specifically affect-
ing respiration, for example, inhibitors such as cyanide, carbon mon-
oxide, hydrogen sulfide, and activators like dinitrophenol, methylene
blue, or pyocyanine. Furthermore, it would be wise to make a 14
parallel study of the effects of these substances by a direct measure
of metabolism.

This example illustrates how rudimentary is our knowledge in 15
this field, since even the simplest experiments which would serve as
a point of departure for a more thorough analysis have not yet been
attempted. It is clear that the biochemical study of the classical 16a
case of *Bonellia* is only in its initial stages, and one hopes that the 16b
metabolism of the larvae of *Bonellia* will be the object of research in
the near future.

It should be noted that, according to Baltzer, a small number of 17
the larvae (5%) swim freely, do not attach to the proboscis, and still
become males. Undoubtedly this is a matter of some individuals 18
which have their sex determined genotypically. Thus it is clearly 19
seen in the case of *Bonellia* that sex may result from a combination
of genotypic and phenotypic factors—with a preponderance of the
latter. From the chemical viewpoint, we see once more that very 20
different agents can influence sex determination and stimulate the
development of intersexes and even the reversal of sex. There is no 21a
reason to believe that these substances exercise their primary action
on cellular oxidations and, at present, this concept must be regarded 21b
as purely hypothetical.

BRA(E)S1: We know that the female of this marine worm has the structure of a sac about 7 to 8 cm. long to which is attached a proboscis attaining a length of almost a meter.

1. almost	D**	ℓ_Q (a[meter])	We know that the female of this marine worm has the structure of a sac about 7 to 8 cm. long to which is attached a proboscis attaining a length of a meter.
2. attaining a length of a meter*	VINGO	r_N (proboscis)	We know that the female of this marine worm has the structure of a sac about 7 to 8 cm. long to which is attached a proboscis.
3. to which is attached a proboscis	PWH-PN	r_N (sac)	We know that the female of this marine worm has the structure of a sac about 7 to 8 cm. long.
4. long	A	r_{QN} (7 cm.)	We know that the female of this marine worm has the structure of a sac about 7 to 8 cm.
5. to 8	to Q	r_{x1} x=Q (7)	We know that the female of this marine worm has the structure of a sac about 7 cm.
6. about	D	ℓ_Q (7)	We know that the female of this marine worm has the structure of a sac 7 cm.
7. 7 cm.	QN	r_N (sac)	We know that the female of this marine worm has the structure of a sac.
8. of a sac	PN	r_N (structure)	We know that the female of this marine worm has the structure.
9. marine	A	ℓ_N (worm)	We know that the female of this worm has the structure.
10. of this worm	PN	r_N (female)	We know that the female has the structure.

* In the grammar of appendix A, <u>of a meter</u> would be taken as a PN right adjunct of <u>length</u>.

** In Appendix A, we write DSTG for D, ASTG for A, SCALESTG for r_{QN}, INT for I (interjection).

BRA(E)S2: The male measures only a few millimeters and lives as a parasite in the intestine or in the uterus of the female.

1. of the female	PN	r_N (uterus)	The male measures only a few millimeters and lives as a parasite in the intestine or in the uterus.
2. or in the uterus	C_cPN	r_{xl} x=N (intestine)	The male measures only a few millimeters and lives as a parasite in the intestine.
3. in the intestine	PN	SA* (C_ctV)	The male measures only a few millimeters and lives as a parasite.
4. as a parasite	PN	r_V (lives)	The male measures only a few millimeters and lives.
5. and lives	C_ctV	r_{xl} x=tV (measures)	The male measures only a few millimeters.
6. only	D	ℓ_T (a[few])	The male measures a few millimeters.

* SA = sentence adjunct

BRA(E)S3A: The fertilized eggs give rise to swimming larvae, which soon become attached to solid objects;

1. solid	A	ℓ_N (objects)	The fertilized eggs give rise to swimming larvae, which soon become attached to objects;
2. soon	D	SA (WH-N)	The fertilized eggs give rise to swimming larvae, which become attached to objects;
3. , which become attached to objects	WH-N	r_N (larvae)	The fertilized eggs give rise to swimming larvae;
4. swimming	VING	ℓ_N (larvae)	The fertilized eggs give rise to larvae;
5. fertilized	VEN	ℓ_N (eggs)	The eggs give rise to larvae;

BRA(E)S3B: before this, sexual differentiation is not yet established;

1. yet	D	SA (linked to negative)	Before this, sexual differentiation is not established(Baltzer);
2. not	D	SA	Before this, sexual differentiation is established(Baltzer);
3. sexual	A	ℓ_N (differen-tiation)	Before this, differentiation is established(Baltzer);
4. before this,	PN	SA	Differentiation is established(Baltzer);
5. (Baltzer)	N	SA	Differentiation is established;

BRA(E)S3C: if the larvae become attached to any ordinary support they develop into females;

1. ordinary	A	ℓ_N (support)	If the larvae become attached to any support they develop into females;
2. if the larvae become attached to any support	SUB1= $C_s C_1$	SA	They develop into females;

BRA(E)S3D: but if they fix themselves to the proboscis of a female they become males.

1. of a female	PN	r_N (proboscis)	But if they fix themselves to the proboscis they become males.
2. if they fix themselves to the proboscis	SUB1= $C_s C_1$	SA	But they become males.

BRA(E)S4A: When the larvae are placed in sea water containing a fragment of the proboscis, a large number of them transform into "intersexes,"

1. large	A	ℓ_N (number)	When the larvae are placed in sea water containing a fragment of the proboscis, a number of them transform into "intersexes,"
2. a number of	N_q of (not in English list)	ℓ_N (them)	When the larvae are placed in sea water containing a fragment of the proboscis, ⓐ they transform into "intersexes," (At ⓐ, them → they when left adjunct a number of is excised.)
3. of the proboscis	PN	r_N (fragment)	When the larvae are placed in sea water containing a fragment, they transform into "intersexes,"
4. containing a fragment	VINGO	r_N (water)	When the larvae are placed in sea water, they transform into "intersexes,"
5. sea	N	ℓ_N (water)	When the larvae are placed in water, they transform into "intersexes,"
6. when the larvae are placed in water,	SUB1= $C_s C_1$	SA	They transform into "intersexes,"

BRA(E)S4B: that is, they show characters intermediate between male and female.

1. intermediate between male and female	ASTG= APN	r_N (characters)	That is, they show characters.
2. that is,	C_c	INTRODUCER*	They show characters.

* In the definition of INTRODUCER, the grammar of appendix A (line 1.2) contains an abbreviated set of C_c.

BRA(E)S5: These interesting observations show that the proboscis of the female exerts a masculinizing influence on swimming larvae which are as yet undifferentiated.

1. as yet	D	ℓ_A (undifferentiated)	These interesting observations show that the proboscis of the female exerts a masculinizing influence on swimming larvae which are undifferentiated.
2. which are undifferentiated	WH-N	r_N (larvae)	These interesting observations show that the proboscis of the female exerts a masculinizing influence on swimming larvae.
3. swimming	VING	ℓ_N (larvae)	These interesting observations show that the proboscis of the female exerts a masculinizing influence on larvae.
4. on larvae	PN	r_N (influence)	These interesting observations show that the proboscis of the female exerts a masculinizing influence.
5. masculinizing	VING	ℓ_N (influence)	These interesting observations show that the proboscis of the female exerts an influence.
6. of the female	PN	r_N (proboscis)	These interesting observations show that the proboscis exerts an influence.
7. interesting	VING	ℓ_N (observations)	These observations show that the proboscis exerts an influence.
8. these	T	ℓ_N (observations)	Observations show that the proboscis exerts an influence.

BRA(E)S6: Baltzer has observed that aqueous extracts of the proboscis also have this masculinizing effect.

1. masculinizing	VING	ℓ_N (effect)	Baltzer has observed that aqueous extracts of the proboscis also have this effect.
2. this	T	ℓ_N (effect)	Baltzer has observed that aqueous extracts of the proboscis also have effect.
3. also	D	ℓ_V (have)	Baltzer has observed that aqueous extracts of the proboscis have effect.
4. of the proboscis	PN	r_N (extracts)	Baltzer has observed that aqueous extracts have effect.
5. aqueous	A	ℓ_N (extracts)	Baltzer has observed that extracts have effect.

BRA(E)S7A: The active substance is resistant to boiling and wide variations in pH, while acetone extracts are on the contrary inactive (Nowinski);

1. (Nowinski)	N	SA (C_sC_1)	The active substance is resistant to boiling and wide variations in pH, while acetone extracts are on the contrary inactive;
2. on the contrary	PN	SA (C_sC_1)	The active substance is resistant to boiling and wide variations in pH, while acetone extracts are inactive;
3. acetone	N	ℓ_N (extracts)	The active substance is resistant to boiling and wide variations in pH, while extracts are inactive;
4. , while extracts are inactive	SUB1= C_sC_1	SA	The active substance is resistant to boiling and wide variations in pH;
5. in pH	PN	r_N (variations)	The active substance is resistant to boiling and wide variations;
6. wide	A	ℓ_N (variations)	The active substance is resistant to boiling and variations;
7. and variations	C_cVn	r_{xl} x = Vn (boiling)	The active substance is resistant to boiling;
8. to boiling	PN	r_A (resistant)	The active substance is resistant;
9. active	A	ℓ_N (substance)	The substance is resistant;

BRA(E)S7B: it would seem therefore that the proboscis contains a water soluble "hormonal factor."

1. water	N	LCDA (water soluble)	It would seem therefore that the proboscis contains a soluble "hormonal factor."
2. soluble	A	ℓ_N (factor)	It would seem therefore that the proboscis contains a "hormonal factor."
3. therefore	INT (inter-jection)	SA	It would seem that the proboscis contains a "hormonal factor."

BRA(E)S8: However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid, carbonic acid, traces of copper, magnesium, potassium.

1. , potassium	C_cN	r_{xl} x=PN (such as: hydrochloric acid)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid, carbonic acid, traces of copper, magnesium.
2. , magnesium	C_cN	r_{xl} x=PN (such as: hydrochloric acid)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid, carbonic acid, traces of copper.
3. traces of	$N_q$of	ℓ_N (copper)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid, carbonic acid, copper.
4. , copper	C_cN	r_{xl} x=PN (such as: hydrochloric acid)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid, carbonic acid.
5. , carbonic acid	N	r_{xl} x=PN (such as: hydrochloric acid)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid.
6. such as: hydrochloric acid	PN	r_N (reagents)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents.
7. very	D	ℓ_A (simple)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of simple reagents.
8. simple	A	ℓ_N (reagents)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of reagents.

BRA(E)S8, continued

9. of reagents	PN	r_N (addition)	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the ⓐ addition. (ⓐ indicates automatic change of article from the to an.)
10. by an addition	PN	SA	However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained.
11. masculine	A	ℓ_N (direction)	However, Herbst has shown that the change of the swimming larvae in a direction can be obtained.
12. in a direction	PN	r_N (change)	However, Herbst has shown that the change of the swimming larvae can be obtained.
13. swimming	VING	ℓ_N (larvae)	However, Herbst has shown that the change of the larvae can be obtained.
14. of the larvae	PN	r_N (change)	However, Herbst has shown that the change can be obtained.
15. however,	INT	SA	Herbst has shown that the change can be obtained.

BRA(E)S9: Thus, masculinization can be attained experimentally by a variety of agents.

1. of agents	PN	r_N (variety)	Thus, masculinization can be attained experimentally by a variety.
2. by a variety	PN	SA	Thus, masculinization can be attained experimentally.
3. experimentally	D	SA	Thus, masculinization can be attained.
4. thus,	D	SA	Masculinization can be attained.

BRA(E)S10: It is reasonable that the substance, as yet unknown, in the proboscis is the only one physiologically active.

1. physio-logically	D	ℓ_A (active)	It is reasonable that the substance, as yet unknown, in the proboscis is the only one active.
2. active	A	r_N (one)	It is reasonable that the substance, as yet unknown, in the proboscis is the only one.
3. in the proboscis	PN	r_N (substance)	It is reasonable that the substance, as yet unknown, is the only one.
4. as yet	D	ℓ_A (unknown)	It is reasonable that the substance, unknown, is the only one.
5. , unknown,	A	r_N (substance)	It is reasonable that the substance is the only one.

BRA(E)S11: Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity of the larvae, a high respiratory rate being characteristic of the female.

1. of the female	PN	r_A (characteristic)	Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity of the larvae, a high respirarate being characteristic.
2. respiratory	A	ℓ_N (rate)	Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity of the larvae, a high rate being characteristic.
3. high	A	ℓ_N (rate)	Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity of the larvae, a rate being characteristic.
4. , a rate being characteristic	SOBJBESA	SA	Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity of the larvae.
5. of the larvae	PN	r_N (activity)	Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity.
6. respiratory	A	ℓ_N (activity)	Herbst believes that the inorganic agents which he has used modify sex through an effect on the activity.
7. on the activity	PN	r_N (effect)	Herbst believes that the inorganic agents which he has used modify sex through an effect.
8. through an effect	PN	SA	Herbst believes that the inorganic agents which he has used modify sex.
9. which he has used	WH-N	r_N (agents)	Herbst believes that the inorganic agents modify sex.
10. inorganic	A	ℓ_N (agents)	Herbst believes that the agents modify sex.

BRA(E)S12A: This is an hypothesis that would be easy to verify experimentally,

1. experimentally	D	SA (THATS-N)	This is an hypothesis that would be easy to verify,
2. that would be easy to verify	THATS-N	r_N (hypothesis)	This is an hypothesis,

BRA(E)S12B: and it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, aqueous extract of proboscis, inorganic salts and acids).

1. and acids	C_cN	r_{xl} x=N (proboscis)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, aqueous extract of proboscis, inorganic salts).
2. inorganic	A	ℓ_N (salts)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, aqueous extract of proboscis, salts).
3. , salts	C_cN	r_{xl} x=N (proboscis)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, aqueous extract of proboscis).
4. of proboscis	PN	r_N (extract)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, aqueous extract).
5. aqueous	A	ℓ_N (extract)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, extract).
6. , extract	C_cN	r_{xl} x=N (proboscis)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis).

BRA(E)S12B, continued

7. (proboscis)	C_cN	r_{xl} x=N (influences)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences.
8. various	A	ℓ_N (influences)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under influences.
9. under influences	PN	SA (WHENS)	And it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate.
10. when the sexes differentiate	WHENS	r_N (time)	And it would be interesting to know whether the intensity of respiration changes at the time.
11. at the time	PN	SA	And it would be interesting to know whether the intensity of respiration changes.
12. of respiration	PN	r_N (intensity)	And it would be interesting to know whether the intensity changes.

BRA(E)S13: As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monoxide, hydrogen sulfide, and activators like dinitrophenol, methylene blue, or pyocyanine.

1. , or pyocyanine	C_cN	r_{xl} x=N (dinitrophenol)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monoxide, hydrogen sulfide, and activators like dinitrophenol, methylene blue.
2. , methylene blue	C_cN	r_{xl} x=N (dinitrophenol)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monoxide, hydrogen sulfide, and activators like dinitrophenol.
3. like dinitrophenol	PN	r_N (activators)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monixide, hydrogen sulfide, and activators.
4. , and activators	C_cN	r_{xl} x=PN (for example, inhibitors)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monoxide, hydrogen sulfide.
5. , hydrogen sulfide	C_cN	r_{xl} x=PN (such as cyanide)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monoxide.
6. , carbon monoxide	C_cN	r_{xl} x=PN (such as cyanide)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide.

BRA(E)S13, continued

7. such as cyanide	PN	r_N (inhibitors)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors.
8. , for example, inhibitors	C_cN^*	r_{xl} x=N (substances)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration.
9. specifically	D	SA (VINGO)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances affecting respiration.
10. affecting respiration	VINGO	r_N (substances)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances.
11. various	A	ℓ_N (substances)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of substances.
12. of substances	PN	r_N (action)	As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia.
13. of Bonellia	PN	r_N (determination)	As Baltzer suggested, it would be very useful to study the action on the sex determination.
14. sex	N	ℓ_N (determination)	As Baltzer suggested, it would be very useful to study the action on the determination.
15. on the determination	PN	r_N (action)	As Baltzer suggested, it would be very useful to study the action.
16. very	D	ℓ_A (useful)	As Baltzer suggested, it would be useful to study the action.
17. as Baltzer suggested,	SAWHICHSTG	SA	It would be useful to study the action.

* For example is a conjunction of a different subtype from ",", and, etc.

BRA(E)S14: Furthermore, it would be wise to make a parallel study of the effects of these substances by a direct measure of metabolism.

1. of metab-olism	PN	r_N (measure)	Furthermore, it would be wise to make a parallel study of the effects of these substances by a direct measure.
2. direct	A	ℓ_N (measure)	Furthermore, it would be wise to make a parallel study of the effects of these substances by a measure.
3. by a measure	PN	SA	Furthermore, it would be wise to make a parallel study of the effects of these substances.
4. of these substances	PN	r_N (effects)	Furthermore, it would be wise to make a parallel study of the effects.
5. of the effects	PN	r_N (study)	Furthermore, it would be wise to make a parallel study.
6. parallel	A	ℓ_N (study)	Furthermore, it would be wise to make a study.
7. furthermore,	INT	SA	It would be wise to make a study.

BRA(E)S15: This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure for a more thorough analysis have not yet been attempted.

1. yet	D	SA	This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure for a more thorough analysis have not been attempted.
2. not	D	SA (C_sC_1)	This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure for a more thorough analysis have been attempted.
3. more	D	ℓ_A (thorough)	This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure for a thorough analysis have been attempted.
4. thorough	A	ℓ_N (analysis)	This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure for an analysis have been attempted.
5. for an analysis	PN	r_N (departure)	This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure have been attempted.
6. which would serve as a point of departure	WH-N	r_N (experiments)	This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments have been attempted.
7. even	D	ℓ_T (the)	This example illustrates how rudimentary is our knowledge in this field, since the simplest experiments have been attempted.
8. (the) simplest	A	ℓ_N (experiments)	This example illustrates how rudimentary is our knowledge in this field, since experiments have been attempted

BRA(E)S15, continued

9. , since experiments have been attempted	SUB1= $C_s C_1$	SA	This example illustrates how rudimentary is our knowledge in this field.
10. in this field	PN	r_N (knowledge)	This example illustrates how rudimentary is our knowledge.

BRA(E)S16A: It is clear that the biochemical study of the classical case of Bonellia is only in its initial stages,

1. only	D	SA	It is clear that the biochemical study of the classical case of Bonellia is in its initial stages,
2. of Bonellia	PN	r_N (case)	It is clear that the biochemical study of the classical case is in its initial stages,
3. classical	A	ℓ_N (case)	It is clear that the biochemical study of the case is in its initial stages,
4. of the case	PN	r_N (study)	It is clear that the biochemical study is in its initial stages,
5. biochemical	A	ℓ_N (study)	It is clear that the study is in its initial stages,

BRA(E)S16B: and one hopes that the metabolism of the larvae of Bonellia will be the object of research in the near future.

1. near	A	ℓ_N (future)	And one hopes that the metabolism of the larvae of Bonellia will be the object of research in the future.
2. in the future	PN	SA	And one hopes that the metabolism of the larvae of Bonellia will be the object of research.
3. of research	PN	r_N (object)	And one hopes that the metabolism of the larvae of Bonellia will be the object.
4. of Bonellia	PN	r_N (larvae)	And one hopes that the metabolism of the larvae will be the object.
5. of the larvae	PN	r_N (metabolism)	And one hopes that the metabolism will be the object.

BRA(E)S17: It should be noted that, according to Baltzer, a small number of the larvae (5o/o) swim freely, do not attach to the proboscis, and still become males.

1. still	D	SA (C_ctVΩ: , and become males)	It should be noted that, according to Baltzer, a small number of the larvae (5o/o) swim freely, do not attach to the proboscis, and become males.
2. , and become males	C_ctVΩ	r_{xl} x=tVΩ (swim)	It should be noted that, according to Baltzer, a small number of the larvae (5o/o) swim freely, ⓐ do not attach to the proboscis. (A morphophonemic change of the comma-conjunction to and might occur at ⓐ .)
3. not	D	SA (C_ctVΩ: , attach to the proboscis)	It should be noted that, according to Baltzer, a small number of the larvae (5o/o) swim freely, *attach to the proboscis. *(Do as carrier of tense drops with the excision of not since the tense then attaches to the verb.)
4. , attach to the proboscis	C_ctVΩ	r_{xl} x=tVΩ (swim)	It should be noted that, according to Baltzer, a small number of the larvae (5o/o) swim freely.
5. freely	D	r_V (swim)	It should be noted that, according to Baltzer, a small number of the larvae (5o/o) swim.
6. (5o/o)	QN (APPOS)	r_N (number)	It should be noted that, according to Baltzer, a small number of the larvae swim.
7. small	A	ℓ_N (number)	It should be noted that, according to Baltzer, a number of the larvae swim.
8. a number of	$N_q$of	ℓ_N (larvae)	It should be noted that, according to Baltzer, the larvae swim.
9. , according to Baltzer,	PN	SA	It should be noted that the larvae swim.

BRA(E)S18: Undoubtedly this is a matter of some individuals which have their sex determined genotypically.

1. genotypically	D	SA (WH-N)	Undoubtedly this is a matter of some individuals which have their sex determined.
2. which have their sex determined	WH-N	r_N (individuals)	Undoubtedly this is a matter of some individuals.
3. some	A	ℓ_N (individuals)	Undoubtedly this is a matter of individuals.
4. undoubtedly	D	SA	This is a matter of individuals.

BRA(E)S19: Thus it is clearly seen in the case of Bonellia that sex may result from a combination of genotypic and phenotypic factors - with a preponderance of the latter.

1. -with a preponderance of the latter	PN*	r_N (factors)	Thus it is clearly seen in the case of Bonellia that sex may result from a combination of genotypic and phenotypic factors.
2. and phenotypic	C_cA	r_{xl} x=A (genotypic)	Thus it is clearly seen in the case of Bonellia that sex may result from a combination of genotypic factors.
3. genotypic	A	ℓ_N (factors)	Thus it is clearly seen in the case of Bonellia that sex may result from a combination of factors.
4. of factors	PN	r_N (combination)	Thus it is clearly seen in the case of Bonellia that sex may result from a combination.
5. of Bonellia	PN	r_N (case)	Thus it is clearly seen in the case that sex may result from a combination.
6. in the case	PN	SA	Thus it is clearly seen that sex may result from a combination.
7. clearly	D	ℓ_V (seen)	Thus it is seen that sex may result from a combination.
8. thus	D	SA	It is seen that sex may result from a combination.

* with a preponderance of the latter is here a variant of a string, with the latter in preponderance (string SUB6 of the English grammar).

BRA(E)S20: From the chemical viewpoint, we see once more that very different agents can influence sex determination and stimulate the development of intersexes and even the reversal of sex.

1. even	D	ℓ_T (the [reversal])	From the chemical viewpoint, we see once more that very different agents can influence sex determination and stimulate the development of intersexes and the reversal of sex.
2. and the reversal of sex	C_cNPN^*	r_{xl} x=N (development)	From the chemical viewpoint, we see once more that very different agents can influence sex determination and stimulate the development of intersexes.
3. of intersexes	PN	r_N (development)	From the chemical viewpoint, we see once more that very different agents can influence sex determination and stimulate the development.
4. and stimulate the development	$C_ctV\Omega$	r_{xl} x=tVΩ (influence determination)	From the chemical viewpoint, we see once more that very different agents can influence sex determination.
5. sex	N	ℓ_N (determination)	From the chemical viewpoint, we see once more that very different agents can influence determination.
6. very	D	ℓ_A (different)	From the chemical viewpoint, we see once more that different agents can influence determination.
7. different	A	ℓ_N (agents)	From the chemical viewpoint, we see once more that agents can influence determination.
8. more	D	r_D^{**} (once)	From the chemical viewpoint, we see more that agents can influence determination.
9. once	D	SA	From the chemical viewpoint, we see that agents can influence determination.
10. chemical	A	ℓ_N (viewpoint)	From the @ viewpoint, we see that agents can influence determination. (At @ an automatic change could be made from the to a certain.)
11. from the viewpoint,	PN	SA	We see that agents can influence determination.

* A string NPN=VnPN is being added to the English string grammar of Appendix I.

** r_D to be added with restrictions to the grammar of Appendix I.

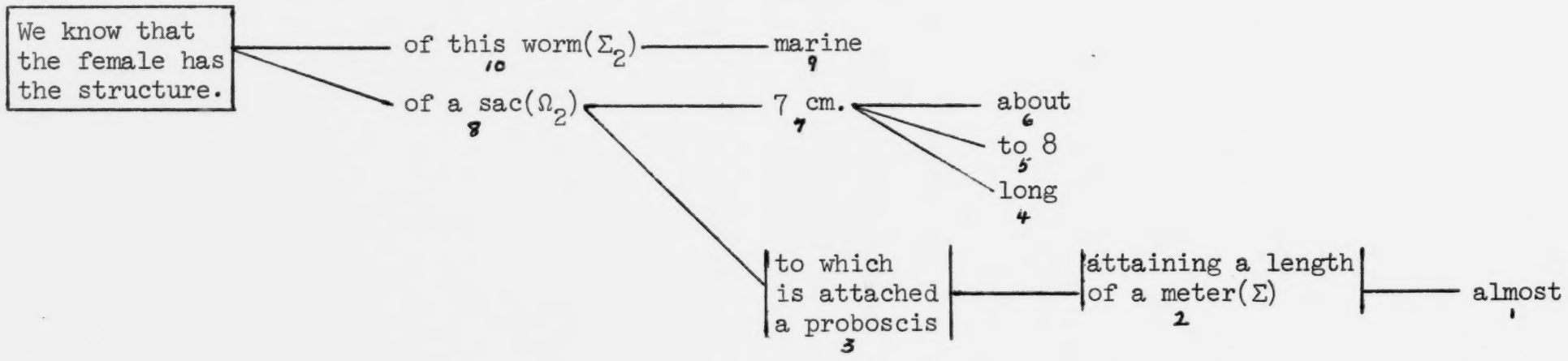
BRA(E)S21A: There is no reason to believe that these substances exercise their primary action on cellular oxidations

1. cellular	A	ℓ_N (oxida-tions)	There is no reason to believe that these substances exercise their primary action on oxidations
2. on oxida-tions	PN	r_N (action)	There is no reason to believe that these substances exercise their primary action
3. primary	A	ℓ_N (action)	There is no reason to believe that these substances exercise their action
4. no	A	ℓ_N (reason)	There is reason to believe that these substances exercise their action

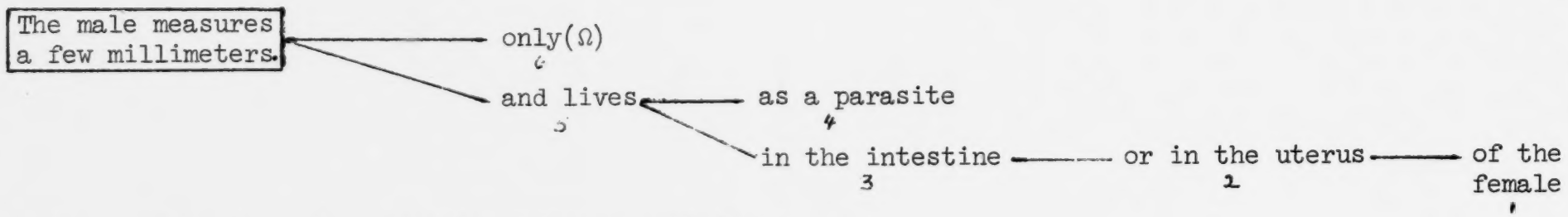
BRA(E)S21B: and, at present, this concept must be regarded as purely hypothetical.

1. purely	D	ℓ_A (hypothetical)	And, at present, this concept must be regarded as hypothetical.
2. , at present,	PN	SA	And, this concept must be regarded as hypothetical.

BRA(E) S1: We know that the female of this marine worm has the structure of a sac about 7 to 8 cm. long to which is attached a proboscis attaining a length of almost a meter.

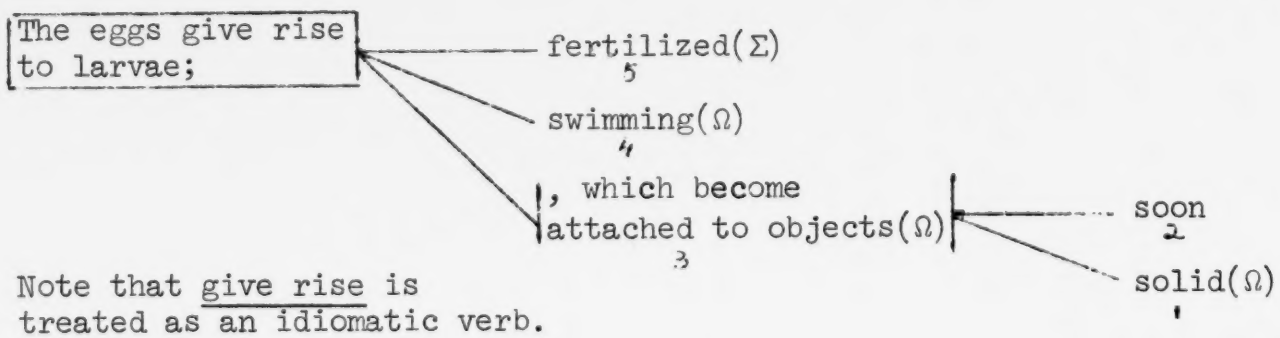


BRA(E) S2: The male measures only a few millimeters and lives as a parasite in the intestine or in the uterus of the female.



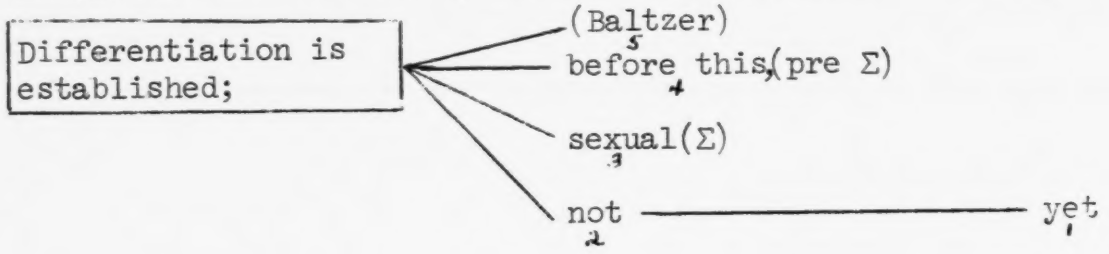
The preferred reading of this sentence contains a zeroed "of the female" adjoining "intestine."

BRA(E) S3A: The fertilized eggs give rise to swimming larvae, which soon become attached to solid objects;

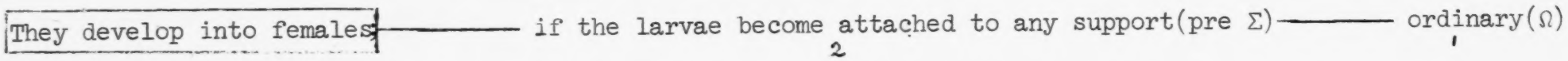


Note that give rise is treated as an idiomatic verb.

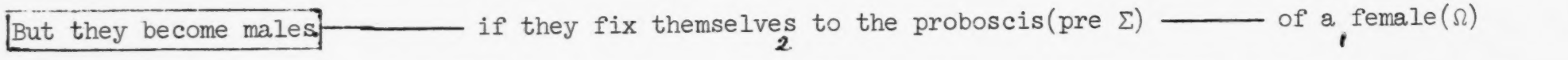
BRA(E) S3B: before this, sexual differentiation is not yet established (Baltzer);



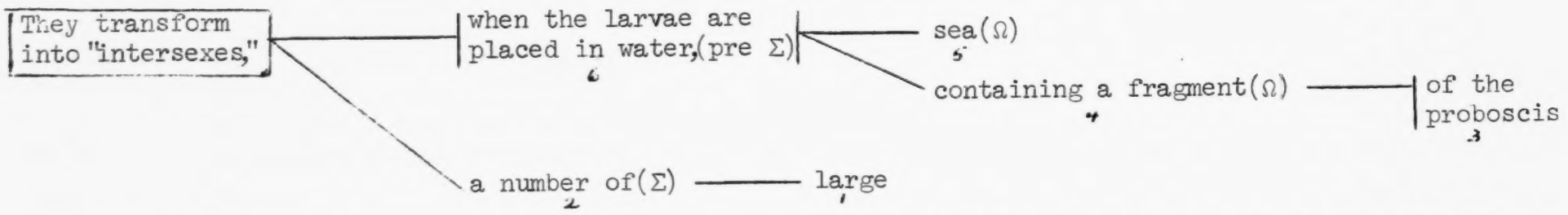
BRA(E) S3C: if the larvae become attached to any ordinary support they develop into females;



BRA(E) S3D: but if they fix themselves themselves to the proboscis of a female they become males.

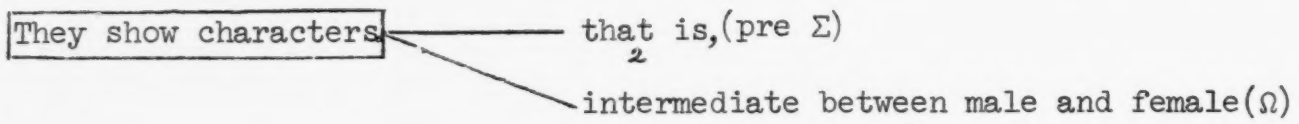


BRA(E) S4A: When the larvae are placed in sea water containing a fragment of the proboscis, a large number of them transform into "intersexes,"

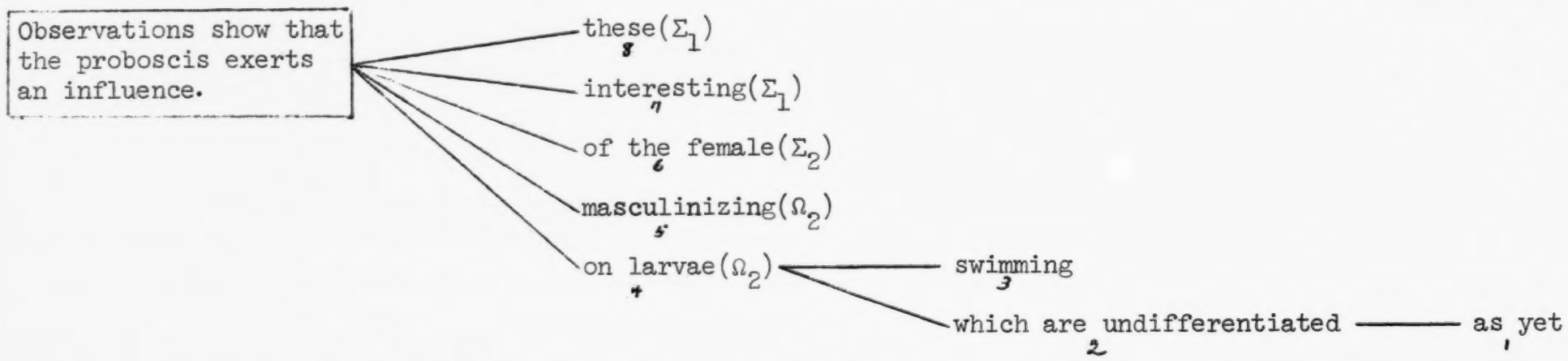

They transform into "intersexes,"
when the larvae are placed in water,(pre Σ) 6
sea(Ω) 5
containing a fragment(Ω) 4
of the proboscis 3
a number of(Σ) 2
large 1

The string "N_q of" (a number of, a preponderance of, etc.) used here is not shown in the English string grammar appended to this paper. Its excision here requires the automatic change from them to they (A number of them transform → They transform).

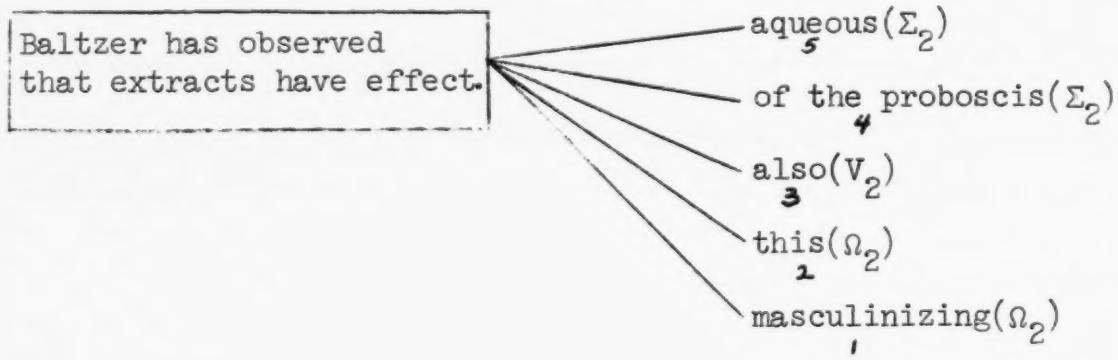
BRA(E) S4B: that is, they show characters intermediate between male and female.



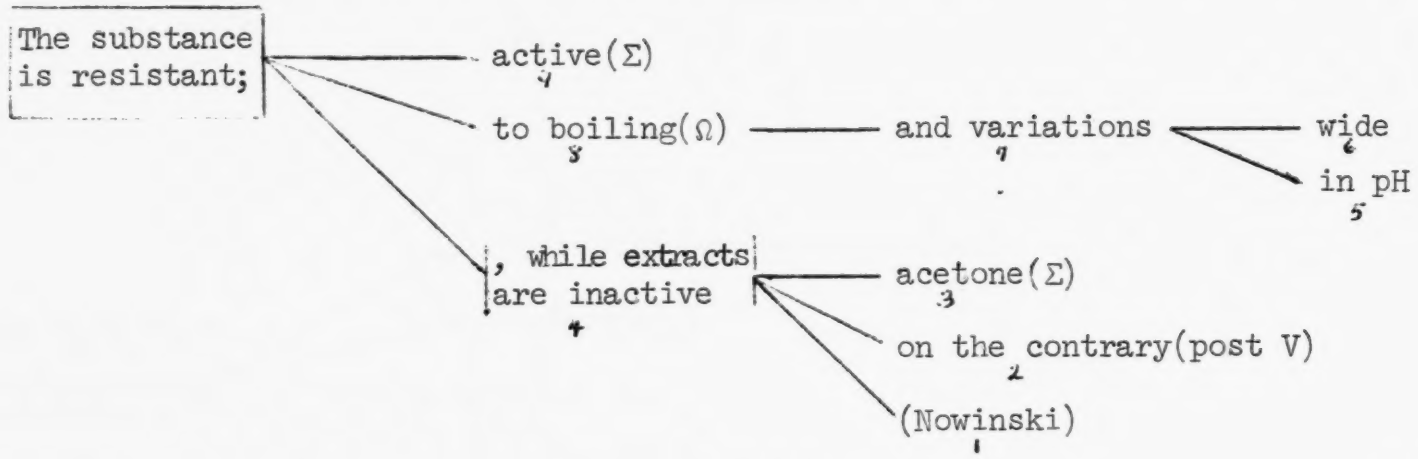
BRA(E) S5: These interesting observations show that the proboscis of the female exerts a masculinizing influence on swimming larvae which are as yet undifferentiated.



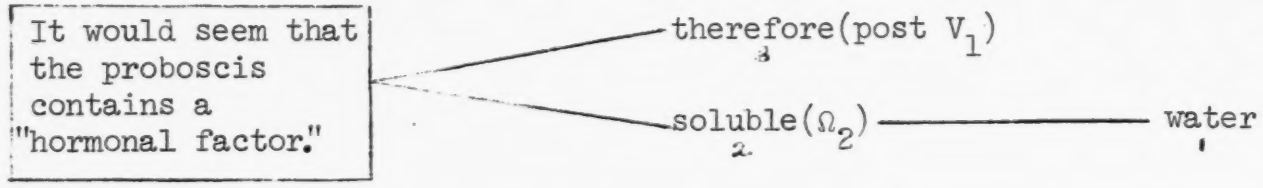
BRA(E) S6: Baltzer has observed that aqueous extracts of the proboscis also have this masculinizing effect.



BRA(E) S7A: The active substance is resistant to boiling and wide variations in pH, while acetone extracts are on the contrary inactive (Nowinski);



BRA(E) S7B: it would seem therefore that the proboscis contains a water soluble "hormonal factor."



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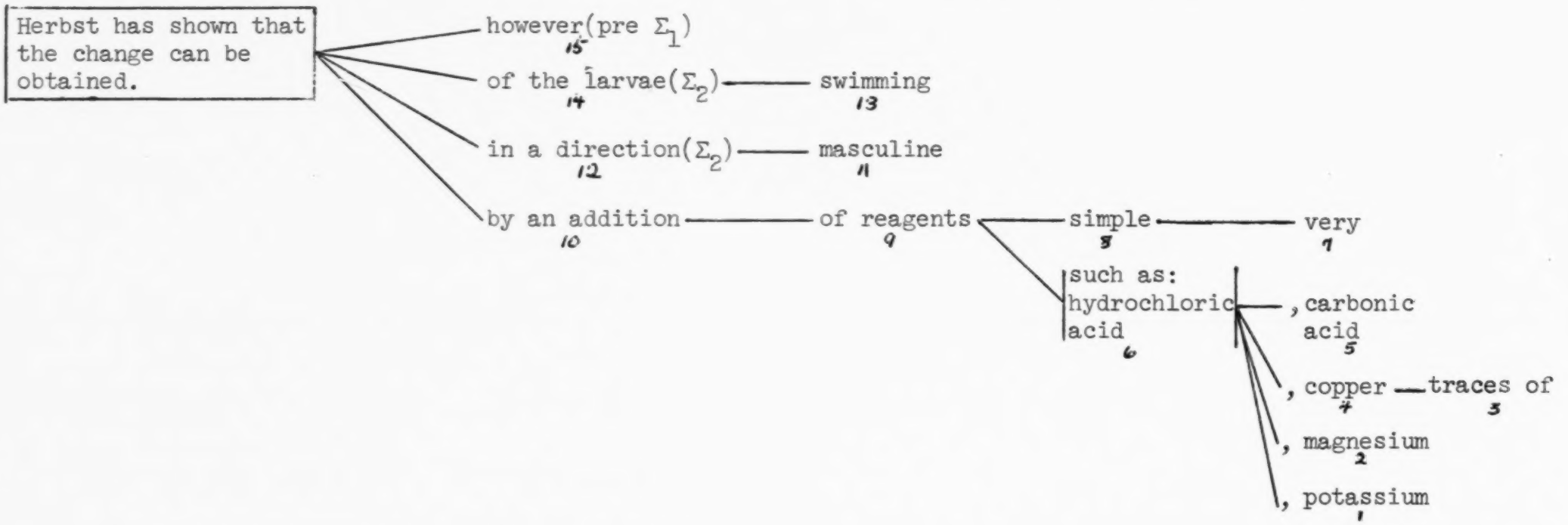
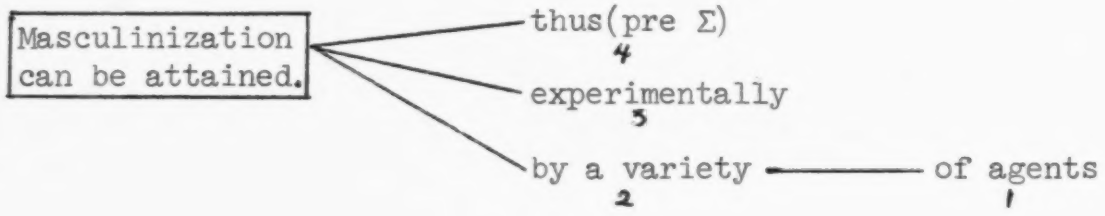
BRA(E) S8: However, Herbst has shown that the change of the swimming larvae in a masculine direction can be obtained by the addition of very simple reagents such as: hydrochloric acid, carbonic acid, traces of copper, magnesium, potassium.



BRA(E) S9: Thus, masculinization can be attained experimentally by a variety of agents.



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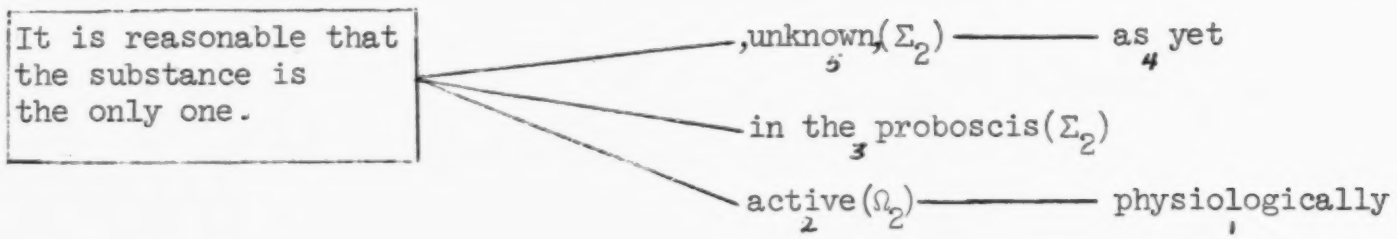
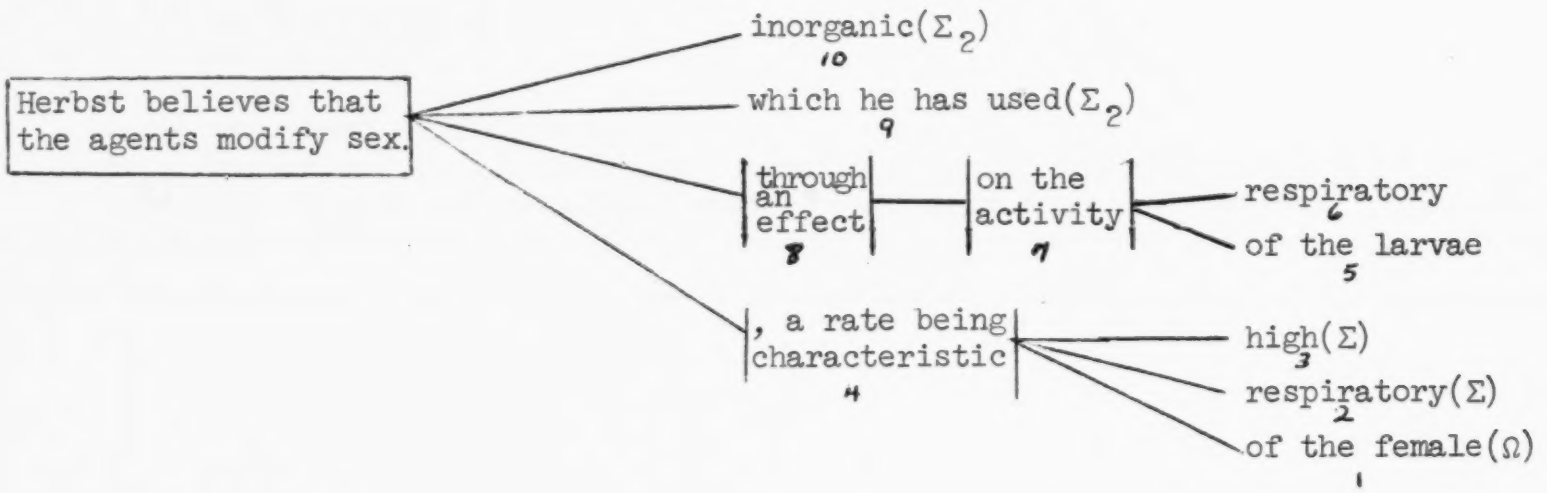
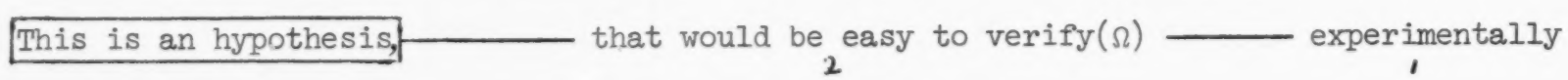
BRA(E) S10: It is reasonable that the substance, as yet unknown, in the proboscis is the only one physiologically active.


It is reasonable that the substance is the only one.
, unknown(Σ2) 5
as yet 4
in the proboscis(Σ2) 3
active(Ω2) 2
physiologically 1

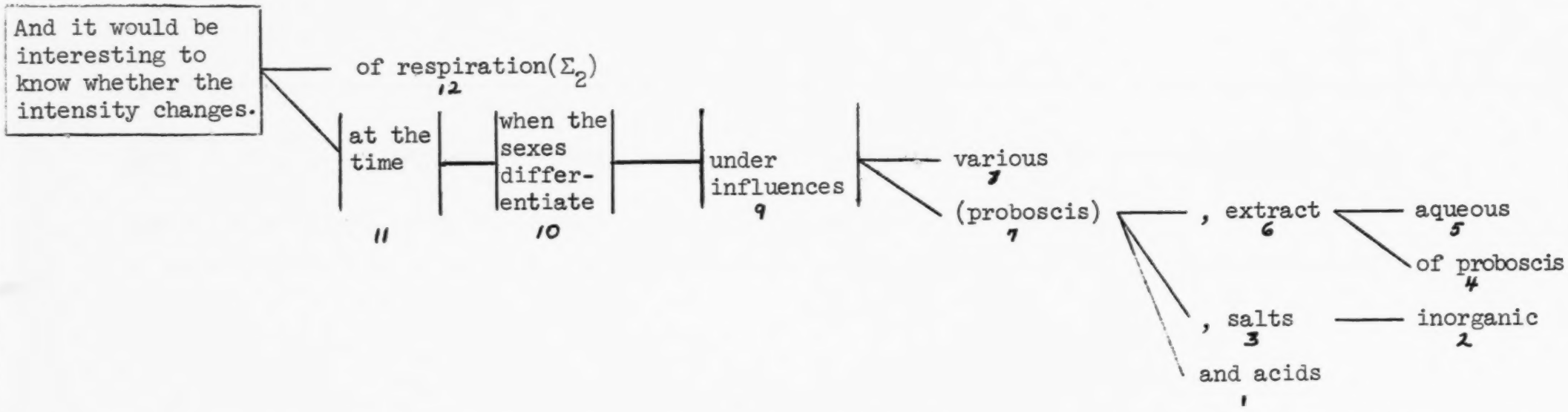
BRA(E) S11: Herbst believes that the inorganic agents which he has used modify sex through an effect on the respiratory activity of the larvae, a high respiratory rate being characteristic of the female.



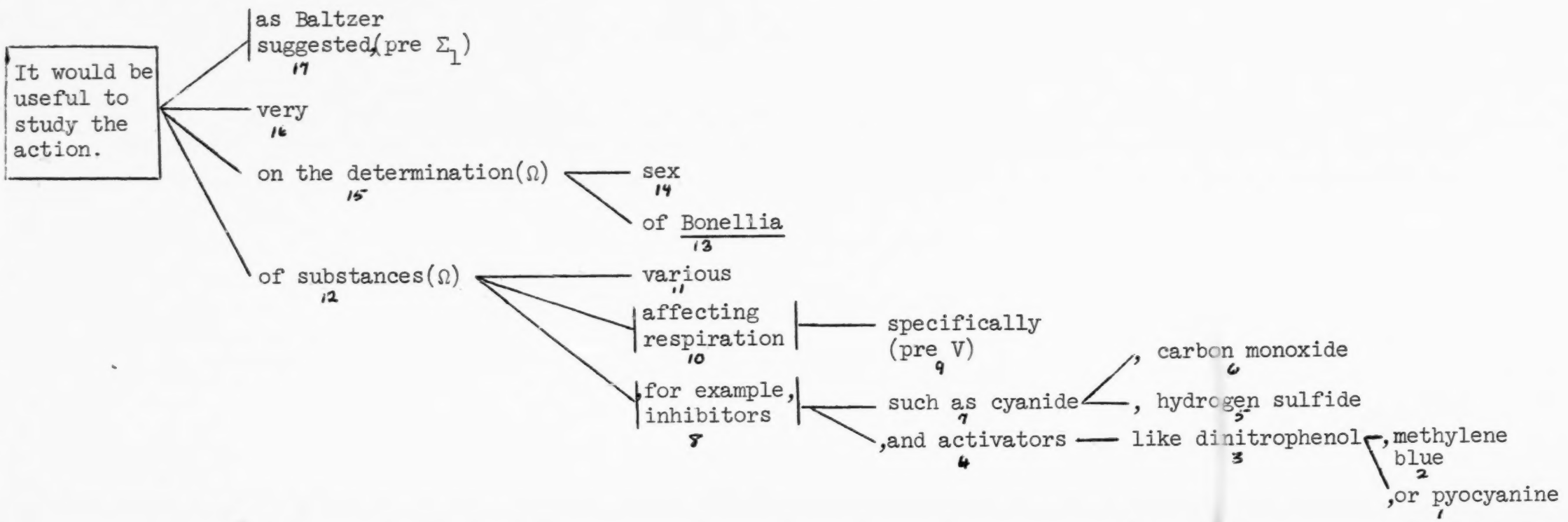
BRA(E) S12A: This is an hypothesis that would be easy to verify experimentally,



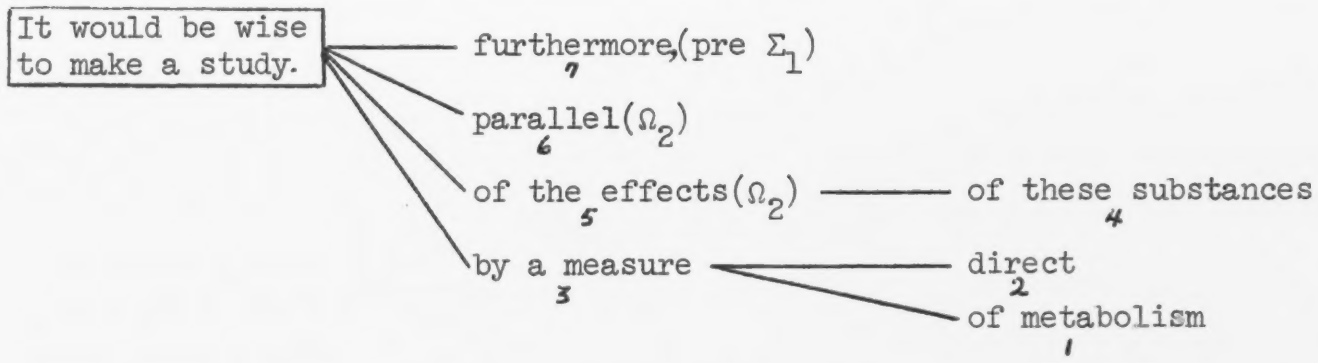
BRA(E) S12B: and it would be interesting to know whether the intensity of respiration changes at the time when the sexes differentiate under various influences (proboscis, aqueous extract of proboscis, inorganic salts and acids).



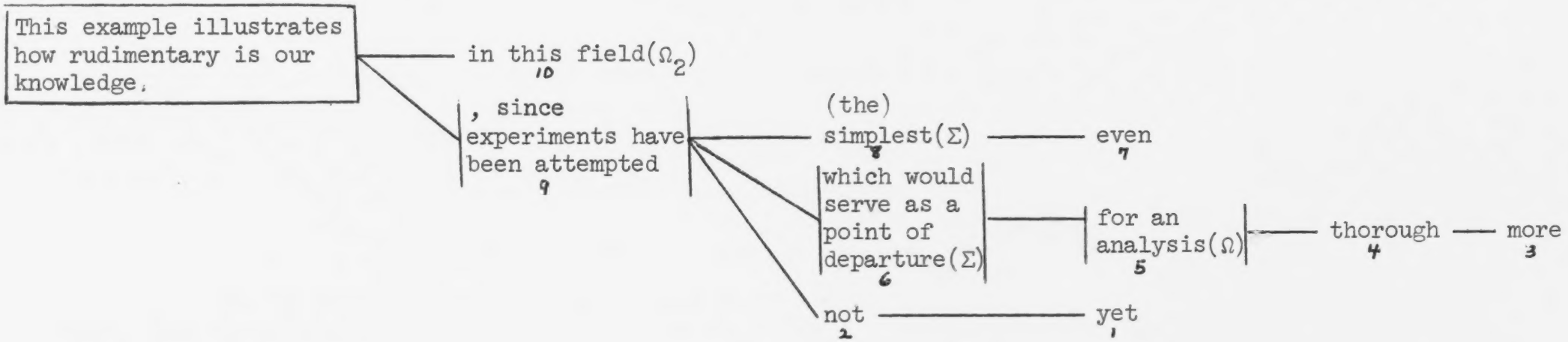
BRA(E) S13: As Baltzer suggested, it would be very useful to study the action on the sex determination of Bonellia, of various substances specifically affecting respiration, for example, inhibitors such as cyanide, carbon monoxide, hydrogen sulfide, and activators like dinitrophenol, methylene blue, or pyocyanine.



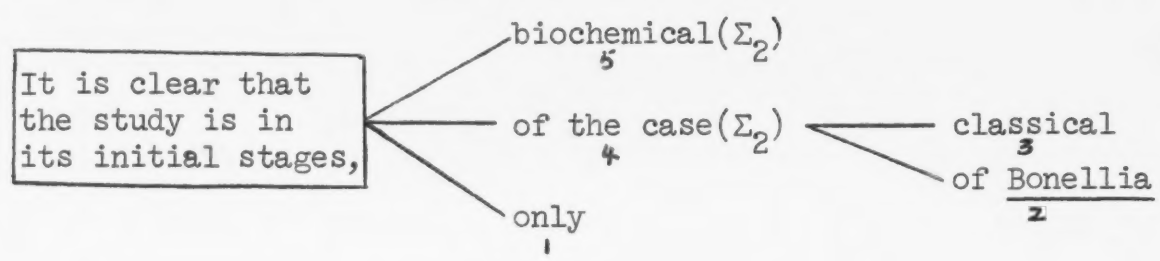
BRA(E) S14: Furthermore, it would be wise to make a parallel study of the effects of these substances by a direct measure of metabolism.



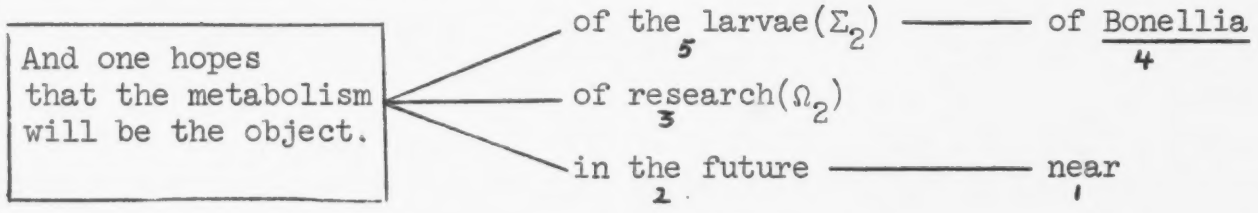
BRA(E) S15: This example illustrates how rudimentary is our knowledge in this field, since even the simplest experiments which would serve as a point of departure for a more thorough analysis have not yet been attempted.


This example illustrates how rudimentary is our knowledge.
in this field(Ω_2) 10
, since experiments have been attempted 9
(the) simplest(Σ) 8
even 7
which would serve as a point of departure(Σ) 6
for an analysis(Ω) 5
thorough 4
more 3
not 2
yet 1

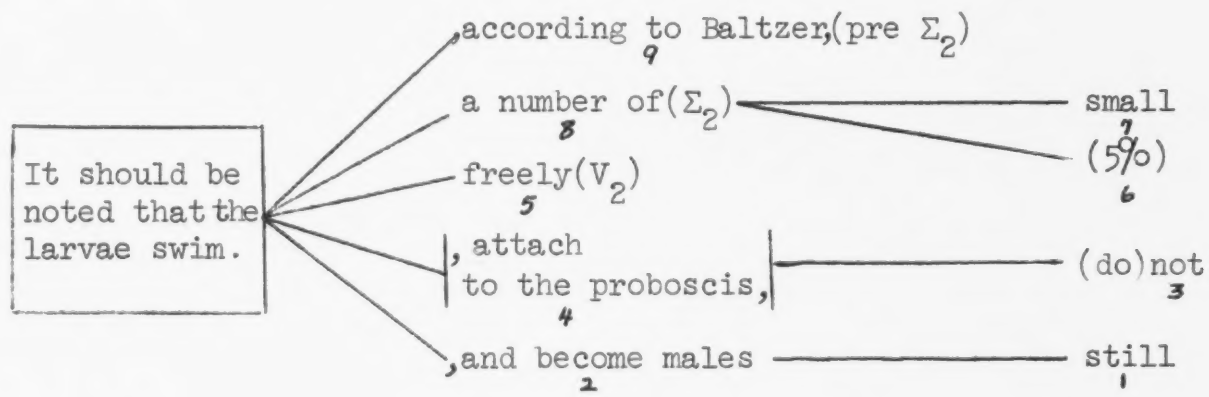
BRA(E) S16A: It is clear that the biochemical study of the classical case of Bonellia is only in its initial stages,


It is clear that the study is in its initial stages,
biochemical(Σ_2) 5
of the case(Σ_2) 4
classical 3
of Bonellia 2
only 1

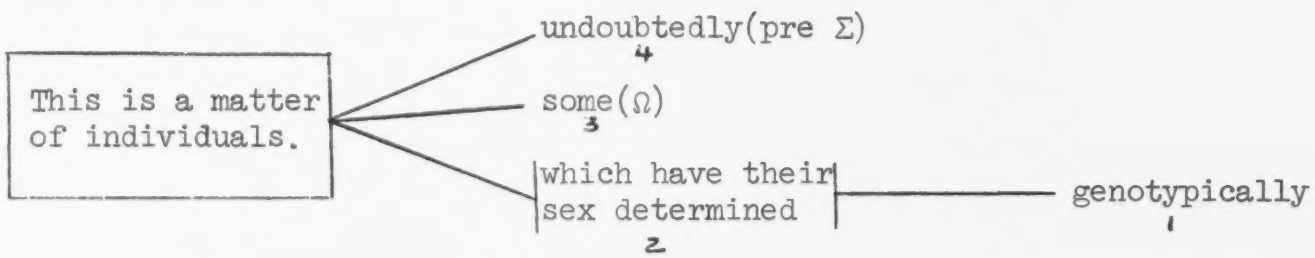
BRA(E) S16B: and one hopes that the metabolism of the larvae of Bonellia will be the object of research in the near future.



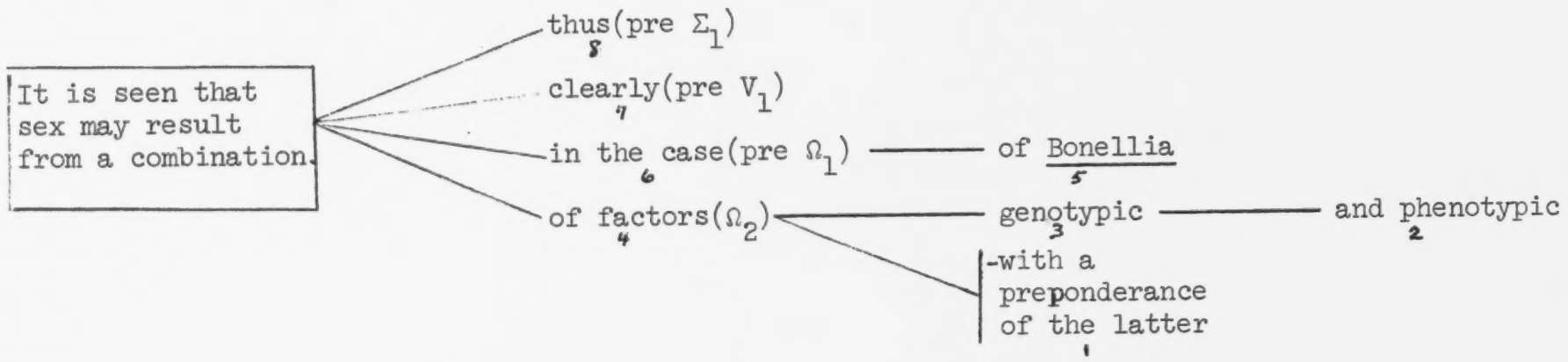
BRA(E) S17: It should be noted that, according to Baltzer, a small number of the larvae (5 %) swim freely, do not attach to the proboscis, and still become males.



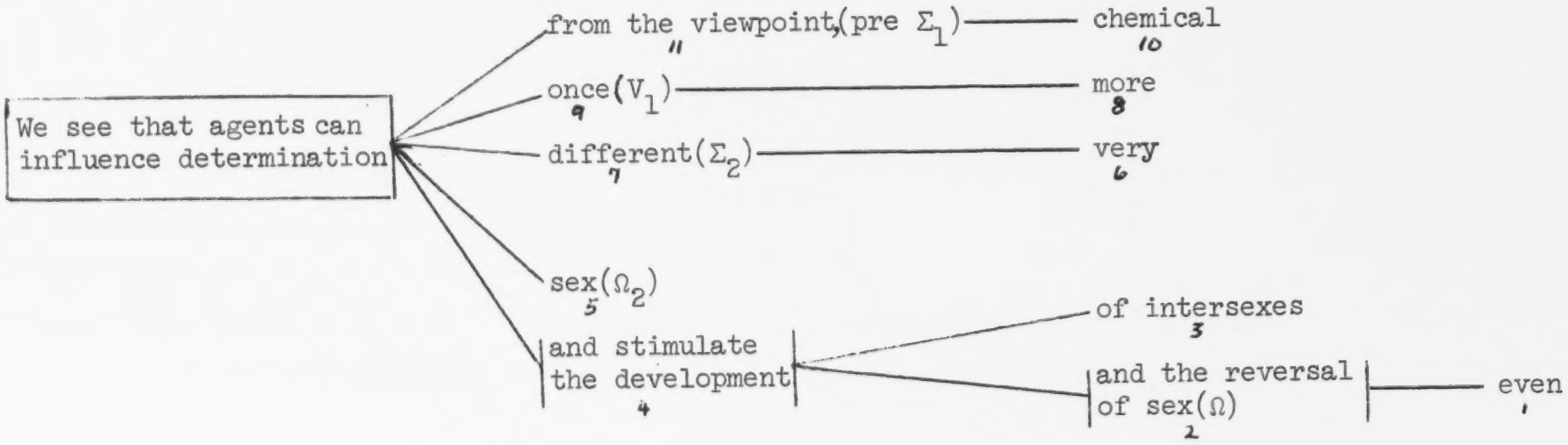
BRA(E) S18: Undoubtedly this is a matter of some individuals which have their sex determined genotypically.



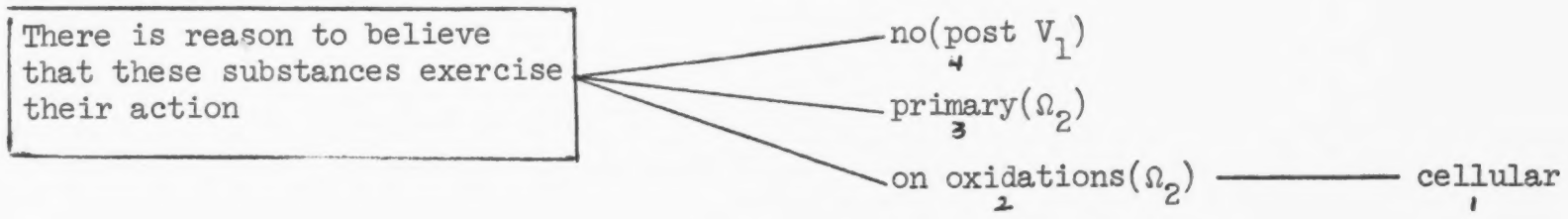
BRA(E) S19: Thus it is clearly seen in the case of Bonellia that sex may result from a combination of genotypic and phenotypic factors - with a preponderance of the latter.


It is seen that sex may result from a combination.
thus(pre Σ_1) 8
clearly(pre V_1) 7
in the case(pre Ω_1) 6 — of Bonellia 5
of factors(Ω_2) 4 — genotypic 3 — and phenotypic 2
-with a preponderance of the latter 1

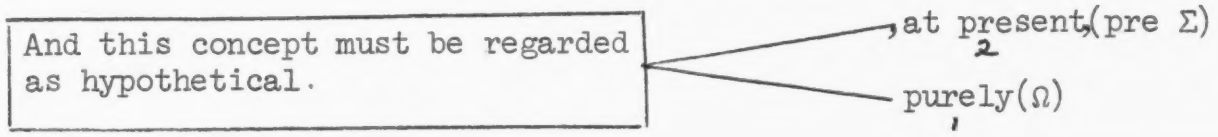
I [illegible] S20: From the chemical viewpoint, we see once more that very different agents can influence sex determination and stimulate the development of intersexes and even the reversal of sex.


We see that agents can influence determination.
from the viewpoint,(pre Σ_1) 11 — chemical 10
once(V_1) 9 — more 8
different(Σ_2) 7 — very 6
sex(Ω_2) 5
and stimulate the development 4
of intersexes 3
and the reversal of sex(Ω) 2 — even 1

BRA(E) S21A: There is no reason to believe that these substances exercise their primary action on cellular oxidations



BRA(E) S21B: and, at present, this concept must be regarded as purely hypothetical.



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Part 3: Comparison of French and English Strings

I. String properties.

If we compare the string grammars of French and English, i.e. the descriptions of these two languages in terms of the same set of string criteria, we see that the two grammars are very similar. A summary table comparing the French strings of Part 1 with the English strings used by the N.Y.U. computer program for the string analysis of English sentences is presented in Appendix B. The two languages have the same sets of string classes, operating similarly in respect to each other. The larger classes and subclasses of strings are identical in their main (most widely used) members, such as the N tV Ω center, the N-adjunct class, the V-adjunct and sentence-adjunct classes. The great bulk of the differences between the two string grammars are: (a) in formally trivial and semantically irrelevant differences of string relation such as the placing of many adjectives (N-adjuncts) to the right or left of the noun*; (b) in small (even if frequently used) subclasses, such as the V-containing Ω whose form is traditionally called the infinitive (with zero, à, de in French; zero, to in English) as well as -ing in English, and the related lack of a more or less sharply deliniated class of auxiliaries (can, may, etc.) in French, and the automatic se in certain French verbs whose Ω is zero, and the English superlative string (where the French has only le adjoined to the comparative string); (c) in idiomatic (one-member) subclasses of strings, such as certain French de- strings, and en, and ne...que..., and the voilà/voici... string.

String grammars recognize, of course, not only the forms (i.e. the word-class sequences) of strings, but also their gross occurrence-relations to each other. Beyond this, there are, however, also refined occurrence-relations which are properties of various strings, and there are also relative frequencies of use (i.e. of absolute — as against relative — occurrence). In these respects there are many differences between French and English, some of them important to the string grammar. Thus, both English and French have nominalized sentences as subjects and objects in other sentences; but the number of V and A which can be nominalized for this purpose, and the variety of environments in which such nominalizations occur, and the absolute frequency of use, are all so much greater in English as to make the standing of these nominalizations in English string grammar quite different from what it is in French. Also a passive string-form exists in both languages, but has much wider use in English. Certain special strings which are comparable in the two languages such as There is.../Il y a... and It.../Ce..., have detailed differences in respect to their use.

* Though in French (not as compared with English) the placing of the adjective to the right or left of N can affect the meaning. Cf. Part 1, VII ℓ_{N1}, 1.

II. Form-meaning correlation.

If we compare the string analyses of the sentences in the French article with those in the English translation (Part 2), we see that by and large the analyses are similar. That is, the analysis of the French sentence consists of much the same string-structures in the same relations to each other as does the analysis of its English translation. This means that not only do the same string forms and relations appear in both languages, but also the correlation of form with meaning is the same in both languages. To see that this is the case, consider: The French sentences clearly have approximately the same meaning as their English translations; and if they also have approximately the same string structures (not simply the corresponding vocabulary) then the same string structures must be carrying the same grammatical meanings in both languages.

In considering this similarity, it is important to note that the differences between the French and English analyses are not due to any approximative nature of string analysis or of the form-meaning correlation of strings: rather, the differences are due to specific difference-making factors which can be formulated. String-structure differences were stated in Section I, above. We list here differences in translation which are due to factors beyond those noted in Section I.

One such factor is the difference in phonemic connectedness of the corresponding French and English morphemes. In some cases an English morpheme may be excisable, whereas its French-translation morpheme is inexcisable not for syntactic reasons (because of non-occurrence of the French sentence without that morpheme) but merely because the excision of that French morpheme requires a large or unusual morpho-phonemic change in the morpheme to which it was adjoined.

Another such factor is the different distribution of idiomatic strings in the two languages: what is a normal structure in one language may be translated by an idiom in the other.

Yet another is due to certain paraphrastic transformations, chiefly zeroing and pronouning, which do not affect the meaning. Thus French has "appropriate-zeroing" of indefinite pronouns in certain positions where English does not: e.g. portent à penser (BRA(F)S5A1) where English would have to say something like lead one to think (the actual translation in BRA(E)S5 is show).

Another difference-making factor is a translator's choice of a string of different structure than in the original even though a string of the same basic structure is available. Thus, in the example above the translator could just as well have

written lead one to think, which would have been structurally close to the French, or show, which is a verb of a different class that the French original could have used but did not. Such differences, of course, do not reflect a difference between the two grammars except possibly in respect to useage and style.

A final grammatical difference-maker is the difference between the grammatical classifications of the morphemes which carry the same meaning in the two languages. This is more precise than saying that the difference is due to lack of the proper vocabulary in one language in respect to the other. If we cannot translate a word in one language by a corresponding word (in the same grammatical class) in the second language, we can always find some means, some phrase, in the second language which will express the meaning of (i.e. will translate) the original word. But the structure of this phrase will of course not be identical with the grammatical structure of the original word. In this way, what is called vocabulary lack is more precisely grammatical non-correspondence in translation.

To these sources of difference in the string analyses must be added all the cases of loose translation, when something in the original is omitted or semantically changed in the translation: e.g. the effectivement in BRA(F)S5A2.

III. The problem of inflected languages.

In languages, such as French, in which inflection is much more important than in English, there are a number of characteristic differences in string properties and in the excision conditions. Inflection in the words of the center-strings appears as phonemic, morphophonemic, or morpheme-subclass-classifier properties: e.g. the masculine and feminine inflection on nouns which do not indicate males or females, and which therefore could not be decomposed usefully into two morphemes: gender-less noun, plus 'male' (or 'female'). Inflection on adjunct-strings is represented either by morphophomenic requirements of agreement (concord), such as the agreement of adjective with its governing noun; or else it is represented in the less-inflected language by morphemes, such as the prepositional equivalents of case-endings.

The problems of excision are considerably more complex in the case of inflected languages, as is seen in the French sentences here, because there are many cases in which a morpheme can not be excised without requiring major morphophonemic changes in the strings to which it had close relation.

It should also be noted that languages which have rich inflectional systems in

many cases have more kinds of grammatical dependence than the less inflected languages. Thus French with its inflectional structure and rich tense system has a greater use of tense-dependence, including e.g. the subjunctive, than is the case in English. A reason for this is that, historically, with the loss of inflectional endings there is often a loss of the grammatical dependences which were marked by these inflectional endings.

APPENDIX A

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*STRING GRAMMAR OF ENGLISH


*DEFINITIONS

*1.  SENTENCE
<SENTENCE>          ::= <INTRODUCER> <CENTER> <ENDMARK>  .                    1,1
<INTRODUCER>        ::= NULL / AND / OR / BUT / - FOR ,                       1,2
<CENTER>            ::= <ASSERTION> / <QUESTION> /<PROSENT>/<PERMUTATION>.    1,3
<ENDMARK>           ::= ↓.↓ / ↓≥↓ / ↓!↓  .                                    1,4

*2.  CENTER STRINGS
<ASSERTION>         ::= <SA> <SUBJECT> <SA> <VERB> <SA> <OBJECT> <RV><SA>.    2,1
<QUESTION>          ::= <YESNOQ> / <WHQ-N> / <WHQ> / <PWHQ-PN> /              2,2
                        <PWHQ> / <WHNQ-N> / <PWHNQ-PN> / <PWHNQ>  .
<PROSENT>           ::= THIS <SA> .                                           2,3
<PERMUTATION>       ::= <TSUBJVO> / <OBES> .                                  2,4

*3.  QUESTION CENTERS
<YESNOQ>            ::= <SA> <VERB1> <SUBJECT> <RW> <SA> <VERB2>              3,1
                        <OBJECT> <RV> <SA> <ORNOT>  .
<ORNOT>             ::= OR NOT / NULL  .                                      3,2
<WHQ-N>             ::= (WHO / WHOM / WHICH / WHAT / WHOSE) (<YESNOQ> /       3,3
                        <ASSERTION>) .
<WHQ>               ::= <SA>(WHERE / WHEN / HOW / WHY) <YESNOQ> .             3,4
<PWHQ-PN>           ::= <SA><*P>(WHOM / WHICH / WHAT / WHOSE)<YESNOQ> .       3,5
<PWHQ>              ::= <SA><*P>(WHOM / WHICH / WHAT / WHOSE)<YESNOQ> .       3,6
<WHNQ-N>            ::= <SA> (<NSTG> / <VINGOFN>) <YESNOQ> .                  3,7
<PWHNQ-PN>          ::= <SA><*P> (<NSTG> / <VINGOFN>)<YESNOQ> .               3,8
<PWHNQ>             ::= <SA><*P> (<NSTG> / <VINGOFN> ) <YESNOQ> .             3,9

*4.  PERMUTATION CENTERS
<TSUBJVO>           ::= (NEITHER / NOR / <DSTG> / <PN>) <SA> <VERB1>          4,1
                        <SUBJECT> <SA> <VERB2> <OBJECT><RV><SA> .
<OBES>              ::= (<PN> / <ASTG> / <VENPASS> / <DSTG>) <SA> <VERB3>     4,2
                        <VERB4> <SA> <SUBJECT> <SA>  .

*5.  SUBJECT STRINGS
<SUBJECT>           ::= <NSTG> / <VINGSTG> / <SN> .                           5,1
<NSTG>              ::= <LNR> / <NWHSTG> / <NAMESTG> / <LPROR>  .             5,2
<LNR>               ::= <LN> <NVAR> <RN>  .                                   5,3
<NVAR>              ::= <*N> / <*VING> / <*NLLN>  .                           5,4
<NWHSTG>            ::= <WHATS-N>/<WHERES> / <WHEVERS-N> .                    5,5
<NAMESTG>           ::= <*N> (<NUMBRSTG> / <*N> ) .                           5,6
<LPROR>             ::= <LPRO> <*PRO> <RN>  .                                 5,7
<VINGSTG>           ::= <NSVINGO> / <VINGOFN> .                               5,8
<NSVINGO>           ::= <TPOS> <VINGO> .                                      5,9
<VINGOFN>           ::= <LN> <*VING> ( <OBJECT> / OF ( <NSTGO> /              5,10
                        <VINGSTG> / <NPN> ))<RV> <SA> .
<SN>                ::= <THATS> / <FORTOVO> / <TOVO> / -<SVINGO> /            5,11
                        <C1SHOULD> / <SNWH> / - <THATVING> .

*6.  SENTENCE NOMINALIZATION STRINGS SN
<THATS>             ::= THAT <ASSERTION> .                                    6,1
<FORTOVO>           ::= FOR <SUBJECT> <SA> <TOVO> .                           6,2
<SVINGO>            ::= (<NSTG> / <VINGSTG>)<VINGO> .                         6,3
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*EXAMPLES OF ENGLISH STRINGS



*1.  SENTENCE
* 1.1      AND PHYSICISTS ARE MADE OF ATOMS.
* 1.3      HE IS HERE / IS IT TRUE / THIS IN SPITE OF THE FACT THAT... /
          RIGHT YOU ARE
* 1.4      PERIOD / QUESTIONMARK / SEMICOLON

*2.  CENTER STRINGS
* 2.1      EVERYTHING CONSIDERED, HE HANDLED THE SITUATION WELL, HOWEVER
* 2.2      (SEE 3.)
* 2.3      AND THIS THOUGH EVERY SPEAKER WILL ACCEPT UTTERANCES THAT
*          HE HAS NOT HEARD BEFORE
* 2.4      (SEE 4.)

*3.  QUESTION CENTERS
* 3.1      MAY I ADD A POINT, HAVE THEY LEFT OR NOT, IS HE GOING
          RELIGIOUS ON US, WAS IT JOHN OR MARY
* 3.3      WHOM CAN ONE RELY ON TO DO THE JOB
* 3.4      WHERE ARE YOU GOING
* 3.5      OF WHOM DID THEY SPEAK
* 3.6      FROM WHERE SHOULD WE BEGIN
* 3.7      WHOSE BOOK IS ON THE TABLE
* 3.8      FROM WHAT SOURCE DO YOU HAVE IT
* 3.9      DURING WHICH REWRITING OF THE MANUSCRIPT DID THAT CHAPTER
*          DISAPPEAR


*4.  PERMUTATION CENTERS
* 4.1      NEITHER IS IT FALSE, NOR CAN ONE SAY THE CONTRARY
* 4.2      AT STAKE IS THE FUTURE OF PUBLIC EDUCATION IN N.Y., FAR MORE
*          CONSTANT IS THE ALKALINITY OF SEA WATER


*5.  SUBJECT STRINGS
* 5.1      A SOCIETY / A VAST RESTRUCTURING OF OUR LAWS / WHETHER HE WILL
*          CONTINUE TO ADHERE TO HIS TACTICS
* 5.2      THE LECTURE / WHAT HE SAID / JOHN JONES / ONLY HE
* 5.3      THE AILING MAN WHO WAS WAITING HIS TURN, THE WRETCHED OF THE
*          EARTH (NVAR = NULLN)
* 5.5      WHAT HE SAID / WHERE HE LIVES / WHATEVER HE DOES
* 5.6      PAGE 3 / JOHN JONES
* 5.7      WE THE PEOPLE, HE WHO HESITATES
* 5.9      THEIR WRITING LETTERS FREQUENTLY
* 5.10     THEIR WRITING OF LETTERS, A HASTY LOOKING UP OF THE NUMBER
* 5.11     (SEE 6.)

*6.  SENTENCE NOMINALIZATION STRINGS SN
* 6.1      THAT TIME IS MONEY HAS NEVER BEEN REALIZED IN THE EAST
* 6.2      FOR HIM TO GO IS FOOLISH, I PREFER FOR YOU TO GO
* 6.3      BEING TAKEN WITH VERT OR VENISON WAS DECLARED TO BE EQUIVALENT
*          TO INDICTMENT, OBSERVE THEIR INTELLECT AND THEIR MORAL SENSE
*          EXPANDING
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<THATVING>          ::= <SN> <VINGO> ,                                                    6,4
<C1SHOULD>          ::= [THAT] <ASSERTION> ,                                              6,5
<SNWH>              ::= <WHETHS> / <WHETHTOVC> / <WHS-N> / <PWHS> /                       6,6
                        <PWHS-PN> / <WHNS-N>   / <PWHNS>    / <PWHNS-PN> ,

*7,  VERB AND VERBAL OBJECT STRINGS
<VERB>              ::= <LTVR> / <LWR> <SA> <LVR> / <LVR> ,                               7,1
<LTVR>              ::= <LV> <*TV> <RW> <RV> ,                                            7,2
<LWR>               ::= <LW> <*W> <RW> ,                                                  7,3
<LVR>               ::= <LV> <*V> <RV> ,                                                  7,4
<VENO>              ::= <LVENR> <SA> <OBJECT> <RV> ,                                      7,5
<LVENR>             ::= <LV> <*VEN> <RV> ,                                                7,6
<VENPASS>           ::= <LVSA> <LVENR> <SA> <PASSOBJ> <RV> <SA> ,                         7,7
<LVSA>              ::= NULL / <DSTG> ,                                                   7,8
<VINGO>             ::= <LVSA> <LVINGR><SA><OBJECT><RV><SA> ,                             7,9
<LVINGR>            ::= <LV><*VING><RV> ,                                                 7,10
<VO>                ::= <LVR> <SA> <OBJECT> <RV> ,                                        7,11
<TOVO>              ::= <LV> TO <LVR><SA> <OBJECT><RV><SA> ,                              7,12
<VERB1>             ::= <LWR> / <LTVR> ,                                                  7,13
<VERB2>             ::= <LVR> <SA> / NULL ,                                               7,14
<VERB3>             ::= <LTVR> / <*W> <RW> <SA> <LVR> ,                                   7,15
<VERB4>             ::= NULL / <*VEN> / TO <*V> ,                                         7,16

*8,  OBJECT STRINGS
<OBJECT>            ::= <NSTGO> / <*NULLOBJ> / <OBJECTBE> / <VENO> / <VO>                 8,1
                        <THATS> / <TOVO> / <SASOBJBE> /
                        <NPN> / <PNN> / <VINGOFNPN> /
                        <PNVINGOFN> / < NPVINGOFN> / <ASOBJBE> / <NPSVINGO>
                        / <NPVINGO> / <NPSNWH> / <DPOFN> / <DPN> / <NDP>
                        / <DPOFNPN> / <DPNPN > / <NDPPN> / <DPSN> / <DPPN>
                        / <PN> / <PVINGOFN> / <PSVINGO> / <PVINGO>/
                        <PSNWH> / <OBJBE> / <VINGSTG> / <SNWH> / <WHETHS> /
                        <SVINGO> / <C1SHOULD> / <FORTOVO> / <NTOVO> /
                        <NTHATS> / <PNTHATS> / <NSNWH> / <PNSNWH> /
                        <NN> / <SOBJBE> / <SVEN> / <NA> / <ADJN> / <ND>
                        / <VINGO> / <NANDN> / <PNTHATSVO> / <SVO> / <ASTG>
                        / <DSTG> / <DPSTG> / <ASSERTION> / <STOVO-N> ,
<PASSOBJ>           ::= <*NULLOBJ> / <THATS> / <ASOBJBE> / <PN>/<PVINGOFN>/               8,2
                        <PSVINGO> / <PVINGO> / <PSNWH> / <DPSTG> / <PSTG> /
                        <VINGO> / <FORTOVO> / <TOVO> / <ASSERTION> /
                        <NSTGO> / <WHSN> / <OBJBE> / <VENPASS> / <ASTG>
                        / <DSTG> / <VO> / <DPP> / <DPPN> ,
<OBJECTBE>          ::= <VENPASS> / <VINGO> / <OBJBE> / <SN> / - <VINGSTG>                8,3
                        / <TOVO> / - <ASSERTION> / - <BEINGO> ,
<OBJBE>             ::= <ASTG> / <NSTG> / <PN> / <DSTG> ,                                 8,4
<BEINGO>            ::= <LV> BEING (<LAR> / <NSTG>) ,                                     8,5
<NSTGO>             ::= <NSTG> ,                                                          8,6
<NN>                ::= <NSTGO> <SA> <NSTGO> ,                                            8,7
<NANDN>             ::= (<NSTGO> / <VINGSTG>) AND (<NSTGO> / <VINGSTG>) ,                 8,8
<ASTG>              ::= <LAR> / <LQNR> ,                                                  8,9
<LAR>               ::= <LA> <AVAR> <RA> ,                                                8,10
<ADJN>              ::= <ASTG> <SA> <NSTGO> ,                                             8,11

*8A,  P STRINGS
<PSTG>              ::= <*P> ,                                                            8A,1
<PSTGS>             ::= <PN> / <PVINGOFN> / <PSVINGO> ,                                   8A,2
<PN>                ::= <LP><*P><NSTGO> ,                                                 8A,3
<PVINGOFN>          ::= <*P> <VINGSTG> ,                                                  8A,4
<PSVINGO>           ::= <*P> <SVINGO> ,                                                   8A,5
<PVINGO>            ::= <*P> <VINGO> ,                                                    8A,6
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* 6.4      FOR PEOPLE TO AGE AT DIFFERENT RATES BEING CONSIDERED NATURAL
*          IS RARE
* 6.5      THAT HE BE THERE IS DESIRABLE, INSIST THAT JUSTICE (SHOULD) BE
*          DONE
* 6.6      (SEE 15.)


*7.  VERB AND VERBAL OBJECT STRINGS
* 7.1      ALMOST FAINTED / JUST CAN+T SING IN TUNE / TRY HARDER
* 7.5      GONE FOREVER
* 7.7      FREQUENTLY SEEN DRINKING
* 7.9      WALKING ON AIR
* 7.12     (TRIES) TO MAKE ENDS MEET


*8.  OBJECT STRINGS
* 8.4      (IS) ROUND / (IS) A MAN / (IS) ON TOP / (IS) HERE
* 8.5      (IS) BEING FOOLISH, (IS) BEING A FOOL
* 8.6      (WE LIKE) HIM
* 8.7      (BUY) HIM A BOOK
* 8.8      (COLLECT) A PEN AND PAPER
* 8.9      (HE WAS) VERY CAREFUL NOT TO HURT THEM, (IT IS) TWO
*          INCHES LONG
* 8.11     (MAKE) AVAILABLE A PRINTED FORM


*8A.  P STRINGS
* 8A.1     (HE WAS DISAPPROVED) OF
* 8A.3     (WE COUNT) ON YOU, (HE LEFT) IN HASTE (RV), IN A PINCH (SA)
* 8A.4     (RELY) ON  THEIR SENDING THE MONEY QUICKLY, (RELY) ON  THEIR
*          QUICK SENDING OF THE MONEY
* 8A.5     (ACCOUNT) FOR THE MONEY+S ABSENCE NOT BEING NOTICED
* 8A.6     (SUCCEED) IN CONFUSING THE ISSUE
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```
<PSNWH>          ::= <*P> <SNWH> ,                                              8A,7
<NPN>            ::= <NSTGO> <SA> <PN> ,                                        8A,8
<PNN>            ::= <PN> <SA> <NSTGO> ,                                        8A,9
<VINGOFNPN>      ::= <VINGSTG> <SA> (<PN> / <PVINGOFN> / <PSVINGO> /            8A,10
                     <PVINGO> ) ,
<PNVINGOFN>      ::= (<PN>/<PVINGOFN> / <PSVINGO> / <PVINGO>) <SA>              8A,11
                     <VINGSTG> ,
<NPVINGOFN>      ::= <NSTGO> <SA> <PVINGOFN> ,                                  8A,12
<NPSVINGO>       ::= <NSTGO> <SA> <PSVINGO> ,                                   8A,13
<NPVINGO>        ::= <NSTGO> <SA> <PVINGO> ,                                    8A,14
<NPSNWH>         ::= <NSTGO> <SA> <*P> <SNWH> ,                                 8A,15

*8B,  DP STRINGS
<DPSTG>          ::= <*DP> ,                                                    8B,1
<DPOFN>          ::= <*DP>OF (<NSTGO> / <VINGSTG>) ,                            8B,2
<DPN>            ::= <*DP>(<NSTGO> / <VINGSTG>) ,                               8B,3
<NDP>            ::= (<NSTGO> / - <VINGSTG>)  <*DP> ,                           8B,4
<DPSN>           ::= <*DP> <SA> <SN> ,                                          8B,5
<DPOFNPN>        ::= <DPOFN> ( <PN> / <PVINGOFN> / <PSVINGO> ) ,                8B,6
<DPNPN>          ::= <DPN> ( <PN> / <PVINGOFN> / <PSVINGO> ) ,                  8B,7
<NDPPN>          ::= <NDP> ( <PN> / <PVINGOFN> / <PSVINGO> ) ,                  8B,8
<DPPN>           ::= <*DP> <SA> ( <PN> / <PVINGOFN> / <PSVINGO> ) ,             8B,9
<DPP>            ::= <*DP><*P> ,                                                8B,10

*8C,  OBJECT NOMINALIZATION STRINGS
<NTOVO>          ::= <SUBJECT> <RV> <SA> <TOVO> ,                               8C,1
<SVO>            ::= <ASSERTION> ,                                              8C,2
<NTHATS>         ::= <NSTGO> <RV> <SA> (<THATS> / <ASSERTION>) ,                8C,3
<NSNWH>          ::= <NSTGO> <RV> <SA> <SNWH> ,                                 8C,4
<PNTHATS>        ::= <*P> <NSTGO> <RV> <SA> (<THATS> / <ASSERTION>) ,           8C,5
<PNTHATSVO>      ::= <PN> <RV> <SA> <C1SHOULD> ,                                8C,6
<PNSNWH>         ::= <PN> <RV> <SA> <SNWH> ,                                    8C,7
<STOVO-N>        ::= <SUBJECT> <SA> <TOVO-N> ,                                  8C,8

*8D,  NOMINALIZATIONS WITH ZEROED VERB BE
<SOBJBE>         ::= <SUBJECT> <SA> <OBJBE> <SA> ,                              8D,1
<SVEN>           ::= <SUBJECT> <SA> <VENPASS> <SA> ,                            8D,2
<NA>             ::= <NSTGO> <SA> <LAR> ,                                       8D,3
<ND>             ::= <NSTGO> <SA> <DSTG> ,                                      8D,4
<SASOBJBE>       ::= <SUBJECT> <SA> AS <OBJBE> <SA> ,                           8D,5
<ASOBJBE>        ::= AS <OBJBE> ,                                               8D,6

*9,  SENTENCE ADJUNCT STRINGS
<SA>*R           ::= <*INT>/ <DSTG> <RD> / <PN> / <PA> / <NSTGT>/               9,1
                     <RSUBJ> / <RNSUBJ> / <LCS> <CSSTG> / - <OBJBESA> /
                     - <SOBJBESA> / <VINGC> / <VENPASS> / <SAWH> /
                     <TOVO> / <NV3> ,
<DSTG>           ::= <*D> / <DSTG> <*D> ,                                       9,2
<PA>             ::= <*P> <*ADJ> ,                                              9,3
<NSTGT>          ::= <NSTG> ,                                                   9,4
<RSUBJ>          ::= (<*Q> / <*T>) [<PN> / <*D> ] / <*PRO> ,                    9,5
<RNSUBJ>         ::= <SN> / <RNWH> / - <THATS-N> ,                              9,6
<CSSTG>          ::= <SUB1> / <SUB2> / <SUB3 > / <SUB0> / <SUB5> /              9,7
                     <SUB6> / <SUB4> / <SUB8> ,
<OBJBESA>        ::= <OBJBE> <SA> ,                                             9,8
<SOBJBESA>       ::= <NSTG> <SA> (<OBJBESA> / <VENPASS> / <VINGO> ) ,           9,9
<SAWH>           ::= <SAWHICHSTG> / <WHETHS> / <WHEVERS-N> ,
<NV3>            ::= <NSTG> <SA> <VERB> ,                                       9,11
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* 8A.7     (INQUIRE) ABOUT WHETHER THEY MIGHT APPLY, (A QUESTION) OF
*         WHETHER THEY MIGHT APPLY (RN)
* 8A.8     (ATTRIBUTE) HIS SUCCESS TO CHANCE
* 8A.9     (ATTRIBUTE) TO CHANCE HIS SUCCESS IN ...
* 8A.10    (HE LEFT) CANVASSING TO HIS AIDES / (ATTRIBUTE) HIS LEAVING TO
*         BEING OVERWORKED
* 8A.11    (LEAVE) TO HIS AIDES CANVASSING ALL THE APARTMENTS WHERE ..
* 8A.12    (ASK)  HIM ABOUT THEIR OFFERING HIM MORE MONEY
* 8A.13    (ASK) HIM ABOUT NO ONE HAVING BEEN THERE
* 8A.14    (PREVENT) HIM FROM RUINING HIS HEALTH
* 8A.15    (ASK) HIM ABOUT WHETHER ONES PASSPORT WILL BE STAMPED

*8B.  DP STRINGS
* 8B.1     (CARRY) ON
* 8B.2     (THE LOOKING) UP OF THE NUMBER
* 8B.3     (LOOK) UP THE NUMBER
* 8B.4     (LOOK) IT UP
* 8B.5     (LET) OUT THAT A CHANGE OF GOVERNMENT WOULD BE WELCOME.
*         (FIND) OUT WHETHER HE IS COMING
* 8B.6     (MIXING) UP OF THE LAST NAME WITH THE FIRST
* 8B.7     (MIX) UP THE LAST NAME WITH THE FIRST
* 8B.8     (MIX) IT UP WITH SOMETHING ELSE
* 8B.9     (BOILS) DOWN TO HIS TAKING A BRIBE

*8C.  OBJECT NOMINALIZATION STRINGS
* 8C.1     (ASK) HIM TO JOIN THEM
* 8C.2     (LET) HIM GO, (HAVE) THEM WAIT
* 8C.3     (TELL) HIM THAT SHE IS WAITING / (TELL) HIM SHE IS WAITING
* 8C.4     (ASK)  HIM WHAT HAPPENED
* 8C.5     (REPORT) TO HIM THAT SHE IS WAITING
* 8C.6     (REQUIRE) OF HIM THAT HE SIGN AN OATH
* 8C.7     (INQUIRE) OF HIM WHETHER JOHN WAS THERE
* 8C.8     (HE HAS) PAYING HIS WORKERS TO CONSIDER

*8D.  NOMINALIZATIONS WITH ZEROED VERB BE
* 8D.1     (CONSIDER) HIM A FOOL, (ELECT) HIM PRESIDENT
* 8D.2     (HAVE) THEM DUPLICATED
* 8D.3     (PAINT) IT RED
* 8D.4     (LEAVE) THE DOOR AJAR
* 8D.5     (TREAT) HIM AS A LACKEY
* 8D.6     (SERVE) AS CONTROLS



*9.  SENTENCE ADJUNCT STRINGS
* 9.2      NEARLY / VERY NEARLY
* 9.3      IN GENERAL, IN SHORT
* 9.4      YESTERDAY, LAST JUNE
* 9.5      IDIOTS, ALL OF THEM / HE WAS THERE HIMSELF
* 9.8      AN INVETERATE GAMBLER, HE...
* 9.9      [SEE 15.]
* 9.11     HE WILL, IT SEEMS, BE ALONE THERE
```

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*10,  SUBORDINATE CONJUNCTION (CS) STRINGS
<SUB0>          ::= <*CS0> <OBJBE> <SA> ,                                    10,1
<SUB1>          ::= <*CS1> <ASSERTION> ,                                     10,2
<SUB2>          ::= (<*CS2> / AS / THAN)<VENPASS> ,                          10,3
<SUB3>          ::= <*CS3> <VINGO> ,                                         10,4
<SUB4>          ::= <*CS4> <VINGSTG> ,                                       10,5
<SUB5>          ::= <*CS5> <SVINGO> ,                                        10,6
<SUB6>          ::= <*CS6> <SOBJBE> ,                                        10,7
<SUB7>          ::= <*CS7> <SVEN> ,                                          10,8
<SUB8>          ::= (AS / THAN)<*D> ,                                        10,9

*11,  RN RIGHT ADJUNCTS OF N
<RN>*R          ::= <VENPASS> / <RNP> / <RNWH> / <THATS-N> / <S-N> /         11,1
                    <SN> / <VINGO> / <TOVO> / <TOVO-N> / <FORTOVO-N>/
                    <ADJINRN> / <DSTG> / <APPOS> / WHATSOEVER ,
<RNP>           ::= <PN> / <PVINGOFN> / <PSVINGO> / <PSNWH> ,                11,2
<RNWH>          ::= <WHS-N> / <WHENS> / <PWHS> / <PWHS-PN> /                 11,3
                    <WHNS-N>   / <PWHNS-PN> / - <PWHNS> ,
<TOVO-N>        ::= <TOVO> ,                                                 11,4
<FORTOVO-N>     ::= <FORTOVO> ,                                              11,5
<ADJINRN>       ::= <LAR> / <LQNR> ,                                         11,6
<APPOS>         ::= <NSTG> ,                                                 11,7

*12,  LN LEFT ADJUNCTS OF N
<LN>            ::= <TPOS> <QPOS> <APOS> <NSPOS> <NPOS> ,                    12,1
<TPOS>          ::= <LTR> / <WHLN> / <LNSR> / <HOWQSTG> ,                    12,2
<LTR>           ::= <LT> (<*T> / NULL )  ,                                   12,3
<LNSR>          ::= <LN> <*NS> ,                                             12,4
<LT>            ::= NULL / <*D> /  <*Q>  ,                                   12,5
<WHLN>          ::= WHOSE / WHICH / WHAT / <HOWQASTG> ,                      12,6
<HOWQASTG>      ::= HOW (MUCH / MANY / <*ADJ> ) [OF] <*T> ,                  12,7
<HOWQSTG>       ::= HOW (MUCH / MANY) ,                                      12,8
<QPOS>          ::= NULL / <LQR>  ,                                          12,9
<LQR>           ::= <LQ> <QVAR> <RQ> ,                                       12,10
<QVAR>          ::= <*Q> / <CPDNUMBR> ,                                      12,11
<CPDNUMBR>      ::= <*Q> <*Q> / <CPDNUMBR> <*Q> ,                            12,12
<APOS>          ::= <LAR1> / <LQNR> / NULL  ,                                12,13
<LAR1>          ::= <LA><AVAR><RA1> ,                                        12,14
<AVAR>          ::= <LCDA> <*ADJ>/<LCDVA> (<*VING> / <*VEN>) ,               12,15
<LCDA>          ::= NULL / <*N>  ,                                           12,16
<LCDVA>         ::= NULL    / -<*N> / - <*D> / - <*ADJ> ,                    12,17
<LQNR>          ::= <LQ> <QNPOS> <RQ> ,                                      12,18
<QNPOS>         ::= <QN> / <NQ> ,                                            12,19
<QN>            ::= <NUMBRSTG> <*N> <SCALESTG> ,                             12,20
<NUMBRSTG>      ::= <*Q> / <CPDNUMBR> ,                                      12,21
<SCALESTG>      ::= <*ADJ>/<PN> / OR SO / NULL  ,                            12,22
<NQ>            ::= <*N> <NUMBRSTG> ,                                        12,23
<NSPOS>         ::= NULL    / <*NS> ,                                        12,24
<NPOS>          ::= <LCDN> (<*N> / <*VING>) / NULL  ,                        12,25
<LCDN>          ::= NULL    / <*ADJ>/-<*G> ,                                 12,26

*13,  RIGHT ADJUNCTS - OTHER THAN RN
<RW>            ::= <DSTG> / NULL  ,                                         13,1
<RQ>            ::= OR SO / ENOUGH / NULL  ,                                 13,2
<RA>            ::= <SN> / - <ASSERTION> / <PSTGS> / <TOVO-N>/               13,3
                    <FORTOVO-N> / <TOVO> / ENOUGH  / NULL  ,
<RA1>           ::= ENOUGH   / NULL  ,                                       13,4
<RV>*R          ::= <DSTG> <RD> / <PN> / <QN> ,                              13,5
<RD>            ::= ENOUGH / NULL  ,                                         13,6
```

```
*10.  SUBORDINATE CONJUNCTION (CS) STRINGS
* 10.1     IF AVAILABLE, WHEN A STUDENT, WHILE IN THE ARMY, EXCEPT HERE
* 10.2     BECAUSE IT RAINED, SINCE YOU WERE HERE LAST
* 10.3     WHERE DESIRED / AS REQUESTED
* 10.4     WHILE SLEEPING, THOUGH MEANING WELL
* 10.5     AFTER THEIR HEARING HIS STORY, SINCE HIS WRITING OF
*          THE LETTER
* 10.6     WITHOUT ANYONE BOTHERING ANYONE
* 10.7     WHAT WITH THE MYSTERY STILL A CAUSE CELEBRE
* 10.8     WITH THE MYSTERY STILL UNSOLVED
* 10.9     AS ALWAYS

*11.  RN RIGHT ADJUNCTS OF N
* 11.1     THE SAMPLE TESTED / THE JOY OF LIVING / DRAWINGS BY STUDENT
*          WHICH HE CAN BE SEEN TO HAVE CORRECTED / A MAN THAT I KNOW
*          THE GAME DIPLOMATS PLAY / THE FACT THAT LANGUAGE ACTS AS A
*          SOCIALIZING FORCE / THE BOOK LYING ON THE TABLE / THE MAN TO
*          DO THE JOB / THE MAN TO SEE / THE MAN FOR YOU TO SEE / THE PEOPLE
*          PRESENT / THE PEOPLE HERE / MY FRIEND JOHN / ANYTHING WHATSOEVER
* 11.6     (THE PEOPLE) PRESENT, (A LINE) TWO INCHES LONG
```

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*12.  LN LEFT ADJUNCTS OF N
* 12.1     THE THREE NEWLY ESTABLISHED CHILDREN↓S CRIMINAL COURTS
* 12.2     THE / WHOSE / MY FRIEND↓S / HOW MANY
* 12.3     ALL THE / EVEN
* 12.4     THE NEIGHBOR↓S CHILDREN↓S
* 12.7     HOW MUCH OF A / HOW MANY OF THE / HOW LARGE A
* 12.8     HOW MUCH / HOW MANY
```

```
*13.  RIGHT ADJUNCTS - OTHER THAN RN
* 13.1     (CAN) HARDLY (LEAVE NOW)
* 13.2     (TWO) OR SO
* 13.3     (GLAD) THAT YOU ARE HERE / (GLAD) YOU ARE HERE / (RIPE) FOR
*          CONQUEST / (EASY) TO SEE / (EASY) FOR JOHN TO DO / (PRONE)
*          TO ACT RASHLY / (GOOD) ENOUGH
* 13.5     HE HIT THE BALL HARD / WITH FORCE / THIRTY YARDS
```

```
*14.  LEFT ADJUNCTS # OTHER THAN LN
<LW>              ::= <*D> / NULL  ,                                              14,1
<LV>              ::= NULL    / <DSTG> ,                                          14,2
<LQ>              ::= <DSTG> / NULL / ( NULL / VERY ) (<*ADJ>,'<*VING> /          14,3
                      <*VEN>),
<LA>              ::= <DSTG> / NULL  ,                                            14,4
<LP>              ::= <DSTG> / <QNPOS> / NULL ,                                   14,5
<LCS>             ::= <*D> / NULL  ,                                              14,6
<LPRO>            ::= NULL    / <DSTG> ,                                          14,7

*15.  WH-STRINGS
<WHETHS>          ::= (WHETHER / WHERE / WHEN / HOW / WHY / IF     )              15,1
                      <ORNOT> <ASSERTION> <ORNOT>  ,
<WHETHTOVO>       ::= (WHETHER / WHERE / WHEN / HOW / WHY / IF )                  15,2
                      <TOVO> ,
<WHS-N>           ::= (WHO / WHOM / WHICH / WHAT / WHOSE / THAN / AS)             15,3
                      <ASSERTION> ,
<PWHS>            ::= <*P> (WHOM / WHICH / WHAT / WHOSE / WHERE / WHEN)           15,4
                      <ASSERTION> ,
<PWHS-PN>         ::= <*P>(WHOM /WHICH / WHAT / WHOSE)<ASSERTION> ,               15,5
<WHNS-N>          ::= (<LNR> / <VINGOFN>) <ASSERTION> ,                           15,6
<PWHNS>           ::= <*P>(<LNR> / <VINGOFN>) <ASSERTION> ,                       15,7
<PWHNS-PN>        ::= <*P>(<LNR> / <VINGOFN>) <ASSERTION> ,                       15,8
<WHATS-N>         ::= WHAT <ASSERTION> ,                                          15,9
<WHERES>          ::= WHERE <ASSERTION> ,                                         15,10
<WHENS>           ::= (WHERE / WHEN / NULL  ) <ASSERTION> ,                       15,11
<THATS-N>         ::= THAT <ASSERTION> ,                                          15,12
<S-N>             ::= <ASSERTION> ,                                               15,13
<SAWHICHSTG>      ::= (WHICH / THAN / AS) <ASSERTION> ,                           15,14
<WHEVERS-N>       ::= (WHOEVER / WHOMEVER / WHICHEVER / WHATEVER /                15,15
                      WHOSEVER)<ASSERTION> ,



* ATOMICS (WORD CLASSES): INT (INTERJECTION) ;
* T (ARTICLE); Q (QUANTIFIER); ADJ (ADJECTIVE); D (ADVERB);
* NS (POSSESSIVE NOUN); N (NOUN); PRO (PRONOUN); P (PREPOSITION);
* V (TENSELESS VERB) ;  TV (TENSED VERB);
* VEN (PAST PARTICIPLE) ;  VING (PRESENT PARTICIPLE);
* W (TENSE WORD);  DP (ADVERB-PREPOSITION, POST-V);  WH (WH-WORD);
* CS0-CS7 (SUBORDINATE CONJUNCTIONS);  CONJ (COORDINATING CONJUNCTION) ,

* ZEROS: NULL (0 ADJUNCT; 0 VARIANT OF ELEMENT);   NULLN (0 NOUN);
* NULLOBJ ( 0 OBJECT OF INTRANSITIVE VERB);
* ZOM (0 OF OMISSION DUE TO PRONOUNING IN WH STRING);
* ZC (ZEROED ELEMENT IN CONJUNCTIONAL STRING) ,

* CONSTANTS:  TO, FOR, OF, THAT, THERE ,


ATTRIBUTE (WORD SUBCLASSES)  =  SINGULAR , PLURAL , NEGATIVE ,
     SUPERLATIVE , COMPARATIVE , TIMETAG , NEGADJ ,
NCOUNT1 , NCOUNT2 , COUNT, NAME, AGGREGATE, COLLECTIVE, NTIME1,
     NTIME , NSENT1 , NSENT2 , NSENT3 , NSENTP , NUNIT  , NPREQ ,
     NHUMAN , NONHUMAN , NSCALE , ADJNOUN , NOMINATIVE , ACCUSATIVE ,
     INDEFINITE , PROSELF , PROPOSS , NTYPECF , NCHEM , NLETTER ,
     NMATH , CONCRETE , NSYMBOL ,
VNOPASS , VDO , VBE , VHAVE , VASP , VSENT1 , VSENT3 , VEXP , VMOD ,
     BEREP , VVERYVING , NOTNSUBJ , NOTNOBJ , VNN1 , VMOTION ,
     VVENCOMP , VCOLLECTIVE , VRECIP , VMANNER , VSENT2 , VNN2 ,
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*14.  LEFT ADJUNCTS - OTHER THAN LN
* 14.1     JUST (MIGHT)
* 14.2     NEARLY (FELL)
* 14.3     NEARLY (TWENTY) / (THE) NEXT (THREE PEOPLE)
* 14.4     VERY (YOUNG)
* 14.5     WAY (OFF THE ROAD)
* 14.6     MERELY (BECAUSE ...)
* 14.7     ONLY (HE)


*15.  WH-STRINGS
* 15.1     (WE WONDERED) WHETHER IT WAS SO OR NOT
* 15.2     (WE WEREN↓T SURE) WHEN TO LEAVE
* 15.3     ( WE WEREN↓T SURE) WHOM WE WERE TC CONTACT
* 15.4     (THE NEWSPAPER) IN WHICH I SAW IT
* 15.5     (THE MAN) ON WHOM THEY ARE COUNTING
* 15.6     (THE CHILD) WHOSE MOTHER WAS ILL
* 15.7     (THE BOOK) IN WHOSE PREFACE THE QUOTATION IS TO BE FOUND.
          (AMERICAN SPOKESMEN HERE REFUSED TO SAY, HOWEVER,) WITH
*         WHICH DELEGATIONS THE MATTER WAS DISCUSSED TODAY
* 15.8     (THE MAN) TO WHOSE ARTICLE WE REFER, TO WHICH BOOK HE IS
*         REFERRING (IS OBSCURE)
* 15.9     WHAT HE BUILDS (ENDURES)
* 15.10    (A LETTER CAME FROM) WHERE HE USED TO LIVE
* 15.11    (THE PLACE) WHERE I WAS BORN
* 15.12    (THE MAN) THAT YOU SAW YESTERDAY
* 15.13    (THE MAN) YOU SAW YESTERDAY
* 15.14    (HE RECOVERED,) WHICH SURPRISED US
* 15.15    (CHOOSE) WHICHEVER SUITS YOU
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     OBJLIST , POBJLIST , PVAL , DPVAL , VEVENT ,
ACOLOR , AHUMAN , AINPA  , AINRN , ASENT1 , ASENT3 , APREQ , AASP ,
     AVEN , ASCALE , AWH , AFORTO , ASHOULD , AFORT01 , AFORT02 ,
     ACOMPOUND , ATHAT , ASENT2 ,
DSA , DSA1 , DRN , DRV , DRW , DLQ , DLV , DLA , DLTPRO , DLCS , DLT ,
     DPRED , DLW , DLCOMP , DLP , DPERM , DLOC1 , DLOC2 , DLOC3 ,
     DUNIV , DEVAL , DMIDDLE , DMOBILE , DVERY ,
TPOSS , TDEM , TQUAN , EACHEVRY , TADJ , DEF , INDEF ,
QHALF , QALL , QMANY , QROVING , QNUMBER ,
CSNOTHEAD , CSNOTA  ,
```

Appendix B. Correspondences between the French and English strings.

French	English	In Appendix A English string number
Center strings	CENTER	1.3.,2.
C_1 = Σ tV Ω	ASSERTION = Σ tV Ω	2.1.
Σ Ω^p tV	form lacking	
C_2 = Σ se tV	form lacking (reflexive and reciprocal constructions conform to ASSERTION)	
C_3 = tV Σ	PERMUTATION (less frequent, not all forms are listed)	2.4.,4.
Ω tV Σ		
tV Ω Σ		
Ω Σ tV		
C_4 = [Voici/Voilà] N	form lacking	
C_5 = Ce $tV_{\hat{e}tre}$ X QU C_i^{-X}	treated as ASSERTION	
C_6 = Il y tV_{avoir} N	treated as ASSERTION	
Il tV_{il} Ω	treated as ASSERTION	
C_7 = Σ_s $tV_{\hat{e}tre}$ [N_s/A_s] Ω_s	treated as ASSERTION	
Σ_s tV_s (Ω) Ω_s	treated as ASSERTION	
C_8 = tV-Σ^p ?	QUESTION	2.2.,3.
+ other variants	(slight differences in form)	
C_9 = $C_i^{-\Sigma}$!	EXCLAMATION (not listed)	
(not presented)	PROSENT	2.3.
Subject strings	SUBJECT	5.1.,5.
Σ_1 = N	NSTG	5.2.
Σ_2 = QU $C_{1,2}^{-N}$	NWHSTG(in NSTG)	5.5.,15.9., 15.10.,15.15.
Σ_3 = ce QU $C_{1,2}^{-N}$	equivalent is WHAT-N(15.8) or <u>that which...</u> = <u>that</u> + r_N	

Σ_4 = [QU_{int} / si] C	SNWH(in SN) (but not all SNWH strings)	5.11.,6.6., 15.1.-15.8.
Σ_5 = V Ω	FORTOVO and TOVO(in SN)	5.11.,6.2., 7.12.
Σ_6 = Que C_{1-7}	THATS and ClSHOULD(in SN)	5.11.,6.1., 6.5.
no V-ing nominalization as subject or object in French	SVINGO(in SN)	5.11.,6.3.
no V-ing nominalization as subject or object in French	THATVING(in SN) (rare)	5.11.,6.4.
no V-ing nominalization as subject or object in French	VINGSTG	5.8.-5.10.

Object strings	OBJECT	8.1.,8.
Ω_0 = 0	*NULLOBJ	in 8.1.
Ω_1 = N	NSTGO = object case NSTG	8.6.
Ω_2 = P N	P N	8A.3.
Ω_3 = N P N	N P N	8A.8.
P N N	P N N	8A.9.
Ω_4 = A/N	ASTG	8.9.
Ω_5 = N N/N A	SOBJBE (additional cases in 8D; not all occur in French)	8D.1.
$\Omega_{5'}$ = N P A/N P N	SASOBJBE	8D.5.
Ω_6 = que $C_{1-7}^{(sub)}$	THATS and ClSHOULD	6.1.,6.5.
Ω_7 = N que C_{1-7}	NTHATS	8C.3.
Ω_8 = [de/à] N que $C_{1-7}^{(sub)}$	PNTHATS and PNTHATSVO	8C.5.,8C.6.
Ω_9 = V Ω Ω_{10} = [de/à] V Ω	TOVO	7.12.
Ω_{11} = $N_{(1)}$ [de/à] V Ω	NTOVO	8C.1.
Ω_{12} = [de/à] $N_{(1)}$ [de/à] V Ω	FORTOVO	6.2.

Ω_{13} = $(N_1)V\ \Omega$ $V\ N_1$ (inverted form)	SVO (inverted form rare)	8C.2.
Ω_{14} = V Ω à N_1	form lacking	
V à N_1 Ω	form lacking	
Ω_{15} = [à/de] N V Ω	TOVO preceded by P N adjunct	7.12.
Ω_{16} = $[QU_{int}/si]\ C_{1-7}$ Ω_{17} = (P) QU C_{1-7}^{-N} (P) QU V Ω^{-N}	SNWH (but not all SNWH strings)	6.6., 15.1.-15.8.
Ω_{18} = A que C_{1-7} Ω_{19} = A de V Ω	treated as A with adjunct SN	
Ω_{20} = D	DSTG	9.2.
form lacking	strings consisting of P + Ving-string	8A.4.-8A.7., 8A.10.-8A.14.
in French only with "P" such as concernant, au sujet de	PSNWH	8A.15.
form lacking	DP-strings	8B
Object pronouns: Ω^p	form lacking	

Objects of the verb être:

$\Omega_{\hat{e}tre}$	OBJECTBE	8.3.
$\Omega_{\hat{e}tre1}$ = N	NSTG(in OBJBE)	8.4.,5.2.
$\Omega_{\hat{e}tre2}$ = P N	P N(in OBJBE)	8.4.,8A.3
$\Omega_{\hat{e}tre3}$ = A	ASTG(in OBJBE)	8.4.,8.9.
$\Omega_{\hat{e}tre4}$ = V Ω	TOVO	7.12.
$\Omega_{\hat{e}tre5}$ = à V Ω	TOVO-N rare, not listed in OBJECTBE	11.4.
$\Omega_{\hat{e}tre6}$ = de V Ω	TOVO	7.12.
$\Omega_{\hat{e}tre7}$ = que C_{1-7}	THATS, C1SHOULD(in SN)	6.1.,6.5.

form doesn't exist; que is required	ASSERTION(= THATS with no that)	2.1.
$\Omega_{\hat{e}tre8}$ = D	DSTG(in OBJBE)	8.4.,9.2.
$\Omega_{\hat{e}tre9}$ = Vé Ωé [par/de] N	VENPASS	7.7.
$\Omega_{\hat{e}tre10}$ = Ω_{avoir1} = Vé Ω	VENO	7.5.
Ving forms lacking in French	VINGO(progressive tense)	7.9.
Ving forms lacking in French	VINGSTG	5.8.-5.10.
Ving forms lacking in French	BEINGO	8.5.
Ving forms lacking in French	SVINGO(in SN)	6.3.
occurs, not listed	SNWH(in SN)	6.6.

Right adjuncts of N: r_N	RN	11.1.,11.
r_{N1} = N	APPOS	11.7.
r_{N2} = P N	P N	8A.3.
r_{N3} = A	ADJINRN	11.6.
r_{N4} = Vé Ωé [par/de] N	VENPASS	7.7.
r_{N5} = de [A/D]	limited, not listed	
r_{N6} = QU $C^{-N/P}$ N/O	RNWH, THATS-N	11.3.
form doesn't exist, que is required	S-N (=THATS-N with no that)	15.13.
r_{N7} = Vant Ω	VINGO	7.9.
r_{N8} = à V Ω^{-N}	TOVO-N	11.4.
rare, if at all	FORTOVO-N	11.5.
r_{N9} = que C_{1-7}	THATS and C1SHOULD(in SN)	6.1.,6.5.
r_{N10} = [de/à] V Ω	TOVO	7.12.
occurs, not listed	DSTG	9.2.

form lacking	PVINGOFN, PSVINGO	8A.4.,8A.5.
form lacking	SNWH(in SN)	6.6.
(see PSNWH following Ω_{20})	PSNWH	8A.7.
occurs, not listed	TOVO and FORTOVO(in SN)	6.2.

Left adjuncts of N: ℓ_N	LN	12.1.,12.
ℓ_{N1} = A	APOS	12.13.
ℓ_{N2} = N P	not listed	
ℓ_{N3} = D_q de	not listed	
article not treated here as adjunct	TPOS	12.2.
number not treated here as adjunct (but see II,Σ_1,1.)	QPOS	12.10.
compound noun treated specially (II,Σ_1,1.1.)	NSPOS	12.24.
	NPOS	12.25.

All-position adjuncts of N: a_N

a_{N1} = A(étant A) a_{N2} = N(étant N)	in OBJBESA in SA	9.1.,9.8.,8.4.
a_{N3} = Vé Ωé(étant Vé Ωé)	VENPASS in SA	9.1.
a_{N4} = P N(étant P N) a_{N5} = N/Pro	in OBJBESA in SA	9.1.,9.8.,8.4.

Right adjuncts of A: r_A	RA	13.3.
r_{A1} = P N	PN(in PSTGS)	8A.2.,8A.3.
r_{A2} = que C	THATS and ClSHOULD(in SN)	6.1.,6.5.
r_{A3} = [à/de] V Ω r_{A4} = [à/de] V Ω	TOVO	7.12.
[à/de] V Ω^{-N}	$TOVO^{-N}$	11.4.,11.5.
r_{A5} = D	idiomatic	
form lacking	PVINGO, PSVINGO(in PSTGS)	8A.2.,8A.4., 8A.5.

Adjuncts of A,D, and Q: ℓ_A, ℓ_D, ℓ_Q, r_Q		
ℓ_A = D	DSTG	14.4.
ℓ_D = D	in definition of DSTG	9.2.
ℓ_{Q1} = D	DSTG	14.3.
ℓ_{Q2} = N_d de	not listed	
r_{Q1} = (de) ... à Q (N_m)	treated as conjunctional string	
r_{Q2} = D	OR SO/ENOUGH	13.2.
r_{Q3} = de N_d	part of Q N	12.20.

Adjuncts of the Verb: a_V		
a_{V1} = P N	P N in RV	13.5.,8A.3.
a_{V2} = D	DSTG in RV	13.5.,9.2.

Adjuncts of C (Center string): a_C	SA	9.1.,9.
a_{C1} = D	DSTG in SA	9.1.
D_n (negation)	DSTG in RW	13.1.
a_{C2} = N	NSTGT	9.4.
a_{C3} = P N	P N	8A.3.
a_{C4} = C_s C_{1-7}	SUB1 in CSSTG in SA	9.1.,10.
a_{C5} = C_s V Ω	SUB3 (but Ving Ω in place of V Ω)	10.5.
a_{C6} = en Vant Ω	SUB3	10.4.
a_{C7} = Vant Ω	VINGO in SA	7.9.
a_{C8} = N Vant Ω	SOBJBESA (includes additional cases)	9.9.
a_{C9} = D_{in} C	not listed	
a_{C10} = tV-Σ Ω	not listed	
a_{C11} = C^{cond}	form lacking	
a_{C12} = [de/à] V Ω	equivalent to a PVing form	
a_{C13} = Il y a N_t	closest equivalent is N_t <u>ago</u>	
a_{C14} = tV Σ	NV3	9.11.
a_{C15} = [pour/quant à] N	treated as P N(P = <u>as to</u>)	
a_{C16} = [pour/tout/si][A/D] $tV_{être}$ Σ	not listed	
a_{C17} = [pour/tout/si][A/D] que Σ tV	string headed by <u>however</u> A/D; not listed	
a_{C18} = [tout/quel/quelque] N que Σ tV	WHEVERS-N	15.15.
a_{C19} = ce QU $C_1^{-\Sigma/\Omega}$	close to SAWHICHSTG Additional strings in 9.1. and 10., some of which occur in French.	15.14.

Right adjuncts of X: r_X

r_{X1} = C_c X	similar strings (not listed here)
r_{X2} = C_{cm} X	similar strings (not listed here)

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